



This manual has been scanned by the
Vickers MG Collection & Research Association

www.vickersmg.org.uk

Please support the work of the Association.

Click on the image to donate through PayPal:



Or regularly support us through Patreon:



A not-for-profit company, limited by guarantee, registered in England, Company Registration Number 07855202

SMALL ARMS
TRAINING

VOL. III

—
1931

W. E. S. Hayward.

18 Upper Montagu Street.

W. I.

"A" Squadron

2nd of Count Regiment.

SOLD BY
OFFICIAL COPY

[Notified in Army Orders for September, 1931.]

Crown Copyright Reserved.



26
Manuals
873

SMALL ARMS TRAINING

VOLUME III

°303-INCH VICKERS MACHINE GUN

1931

By Command of the Army Council,

THE WAR OFFICE,
30th September, 1931.

H. J. Creedy

LONDON:

PUBLISHED BY HIS MAJESTY'S STATIONERY OFFICE
To be purchased directly from H.M. STATIONERY OFFICE at the following addresses:
Adastral House, Kingsway, London, W.C.2; 120, George Street, Edinburgh.
York Street, Manchester; 1, St. Andrew's Crescent, Cardiff;
15, Donegall Square West, Belfast;
or through any Bookseller.

1931

Price 2s. 0d. net

57-496-3



SMALL ARMS TRAINING

VOLUME III

303-1000 VICKERS MACHINE GUN

1931

By Command of the Committee

Handwritten signature

PRINTED BY HIS MAJESTY'S STATIONERY OFFICE
LONDON: H.M.S.O. 1931

1931

Price 1/6

CONTENTS

SEC.	PAGE
Definitions	1

PART I TRAINING

CHAPTER I

ORGANIZATION

1. General remarks	4
2. Cavalry	4
3. Infantry	5
4. Intake and turnover	6

CHAPTER II

SYSTEM OF TRAINING

5. Object of training	7
6. Responsibility for training	7
7. Progressive stages in training	8
8. Individual training	9
9. Collective training	10

CHAPTER III

INDIVIDUAL TRAINING

10. System of training	13
11. Sequence of training	13
12. Setting sights and laying an aim	17
13. Indication and recognition—Instruction in fire orders	18
14. Instruction in instruments, dials, etc.	23
15. Night aiming and use of aiming lamp	30

	PAGE
16. Instruction in observation of fire and ranging ..	32
17. Mounting gun on various types of ground and use of cover	35
18. Field signals—Machine guns .. .	40
19. Packing of vehicles	40
20. Pack	45
21. Range-takers	47

CHAPTER IV

DRILL DUTIES AND DRILLS

22. General remarks	49
23. Drill duties	49
24. Elementary gun drill	57
25. Tests of elementary gun drill	74
26. Section drill—Direct fire	79
27. Platoon drill—Indirect fire	84
28. Section drill—Night firing	88
29. Pack saddle drill—Cavalry	90
30. Pack saddle drill—Infantry	100

CHAPTER V

FIELD DUTIES

31. Platoon and section areas—Concealment	108
32. Occupation of a position—Day	110
33. Modifications for indirect fire	114
34. Modifications for an immediate overhead problem ..	117
35. Occupation of a position—Night	118
36. Duties special to defence	119
37. Duties special to rear guard action	121
38. Entrenching	124

PART II

FIRE CONTROL

CHAPTER VI

ELEMENTARY THEORY AND RANGE TABLE

39. Introduction	125
40. Elementary theory	126
41. The Range Table—Climatic influences	130

CHAPTER VII

APPLICATION OF FIRE—GENERAL

	PAGE
42. Basis of fire control rules	135
43. Considerations affecting the area which has to be engaged	135
44. The combined sight rule	136
45. Observation of fire and ranging	139
46. Direct and indirect fire	141

CHAPTER VIII

APPLICATION OF FIRE—DIRECT

47. General remarks	143
48. Methods of fire	143
49. Engagement of targets—Direct	146

CHAPTER IX

APPLICATION OF FIRE—INDIRECT

50. General remarks	153
51. General principles	153
52. Types of voice control methods	155
53. The director method	156
54. The post method	161
55. The distant aiming point method	162
56. The crest method	163
57. Distribution and concentration	164
58. Elevation	166
59. Engagement of targets—Indirect	169
60. Crest clearance	169
61. Night firing	172
62. Shooting from the map	176
63. T.O.G. method	180
64. Charts for fire direction and control	183

CHAPTER X

FLANKING AND OVERHEAD FIRE

65. General considerations	189
66. Flanking fire	190
67. Overhead fire	190

CHAPTER XI

FIRE PLAN AND FIRE DISCIPLINE

	PAGE
68. Fire plan, direction and control	202
69. Fire orders, direct and indirect	205
70. Direct fire orders	206
71. Indirect fire orders	209
72. Examples of direct fire orders	212
73. Examples of indirect fire orders	221
74. Barrage fire	223

APPENDICES

No.		PAGE
I.	Courses—Individual training	225
II.	Load tables—Limber G.S.	229
III.	Load tables—Pack (cavalry)	230
IV.	Load tables—Pack (infantry)	232
V.	A section's equipment laid out for inspection (<i>facing</i>)	232

INDEX	233
---------------	-----

LIST OF PLATES

No.		PAGE
I.	Gun mounted to fire down a steep slope	37
II.	Gun mounted on the side of a bank	38
III.	Detailed method of packing limbers :—	
Fig. 1.	Fore portion—Bottom layer	41
" 2.	" " " —Top layer	41
" 3.	" " " —Side panels (outside)	42
" 4.	Rear portion—Bottom layer	43
" 5.	" " " —Top layer	43
" 6.	" " " —Side panels (outside)	44
IV.	Erecting the tripod	61
V.	Mounting the gun	62
VI.	Normal firing position—Sitting	66
VII.	Mounting the gun—Lowest position	71
VIII.	Lowest position—Firing position	72
IX.	Cavalry gun pack horse (near side)	93
X.	" " " (off side)	94
XI.	Cavalry first ammunition pack horse (near side)	95
XII.	" " " (off side)	96
XIII.	Cavalry second ammunition pack horse (either side)	97
XIV.	Cavalry second ammunition pack horse (general)	98
XV.	Pack saddle—Cavalry	99
XVI.	Infantry gun pack animal (near side)	102
XVII.	" " " (off side)	103
XVIII.	Infantry ammunition pack animal (near side)	104
XIX.	" " " (off side)	104
XX.	Hasty machine-gun emplacements of rifle slit type	123
XXI.	Fighting map—Platoon or section	179
XXII.	Flanking fire	191
XXIII.	A section's equipment laid out for inspection (<i>facing</i>)	232

DEFINITIONS

(See also Vol. I.)

Fire direction.—The term applied to instructions given by the commander of more than one fire unit to the fire unit commanders as to how their fire is to be applied.

Fire control.—The necessary arrangements and orders for hitting the target.

Fire controller.—The individual responsible for giving the orders for the engagement of a target to the men of a fire unit.

Laying.—The process of elevating (or depressing) and traversing a gun until its axis is made to point in any given direction. On conclusion of this process the gun is said to be laid.

Arc of fire.—Arc over which it is desired that guns can bear from a given gun position. Its boundaries are described as "right of arc" and "left of arc."

Near limit of arc.—The near edge of the zone on which fire is required.

Direct fire.—When the gun is laid directly on the target by means of the backsight and foresight.

Indirect fire.—When the gun is laid to hit a given target by other means than by laying on it direct.

Overhead fire.—When the trajectory passes over the heads of our own troops.

Flanking fire.—Fire applied from a flank across the front of a locality occupied by our own troops, or, if they are advancing, at an angle to their line of advance.

Observed fire.—When the effect of the fire can be observed from the gun or from the fire controller's observation post.

Observation post.—A post from which a particular area can be kept under observation or from which artillery and machine-gun fire can be controlled and corrected.

Registering.—The recording of the direction and elevation necessary to hit any given target as found by ranging.
(Vol. I, 1931, Sec. 9.)

In action.—A machine gun is said to be in action when it is mounted with reference to its arc of fire and the necessary men, equipment and ammunition are present at the gun to enable it to open fire when ordered.

Position in readiness.—The position at which the guns are taken off the vehicle or pack animals preparatory to coming into action. It will normally be the nearest point to the gun positions to which the vehicle or pack animals can be brought.

Rendezvous.—A pre-arranged place of assembly.

Angle of sight.—The angle contained between the line of sight and the horizontal plane. By convention, the angle is said to be positive (+) when the target is above the horizontal plane through the gun position (Fig. 1), and negative (−) when the target is below it (Fig. 2).

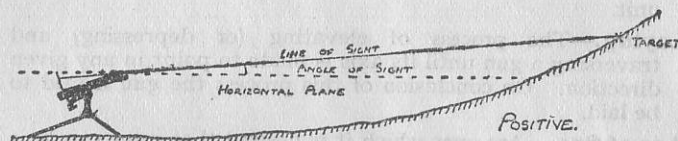


Fig. 1.

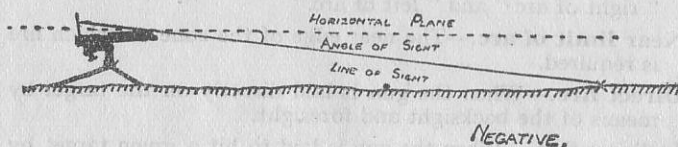


Fig. 2.

Tangent angle (Angle of tangent elevation).—The angle which the axis of the barrel makes with the line of sight. (See Sec. 40, 1, i.)

Quadrant angle.—The angle which the axis of the barrel makes with the horizontal plane. (See Sec. 40, 1, ii.)

Gun aiming mark.—A mark on which a gun is laid to cause the bullets to strike the correct position on the target for that gun.

Auxiliary aiming mark.—A gun aiming mark indicated by the fire controller in the target area, with the object of maintaining fire on the target. It is employed when, for any reason, a point of aim on the target is not used.

Line.—The direction in which a gun or guns are pointed.

Line of fire.—The direction of the target from the gun.

Zero line.—A line of reference, on which all guns are parallel, and from which switches are measured.

Deflection.—A lateral displacement of the lines of any or all guns.

Pivot gun.—The gun used as a basis for calculation.

Distribution.—The opening out of parallel lines of fire.

Angle of distribution.—The angle between adjacent lines of fire opened up to divide a target wider than the gun frontage into equal parts, the flank guns being laid on the flanks of the target.

Concentration.—The closing in of parallel lines of fire.

Angle of concentration.—The angle between adjacent lines of fire concentrated on to a point target, or closed in to divide a target of less width than the gun frontage into equal parts, the flank guns being laid on the flanks of the target.

Safety angle for flanking fire.—Is the minimum lateral angle between the line of fire and the position of our troops for the latter to be safe by flanking fire.

Safety angle for overhead fire.—Is the minimum angle which must be included between the axis of the barrel and the line of sight to our own troops, in order to ensure their safety under overhead fire.

Minimum clearance.—A term used to denote the minimum height of the centre bullet of the cone above the heads of our own troops for the latter to be safe.

SMALL ARMS TRAINING

VOLUME III

303-INCH VICKERS MACHINE GUN

1931

PART I—TRAINING

CHAPTER I

ORGANIZATION

1. *General remarks*

1. This volume deals with the organization and technical training of machine-gun squadrons and companies for war, and their duties in war.

2. The machine-gun squadron or company forms an integral part of the cavalry regiment or infantry battalion, and as such will primarily be trained within its unit. But since the coordination of the action of machine guns in a brigade fire plan will often involve machine-gun squadrons or companies operating for short periods in areas other than those occupied by their own units, they are organized as self-contained sub-units, and will be trained accordingly.

3. The organization of troops and platoons is based on the duties which have to be carried out in order to bring guns into, and maintain them in, action.

4. Throughout the volume the methods laid down for the training of a machine-gun company or platoon apply equally to a machine-gun squadron or troop, except where otherwise specifically stated. The terms "regiment," "squadron" and "troop" should therefore be read where necessary for "battalion," "company" and "platoon."

2. *Cavalry*

1. In war, a cavalry regiment has twelve machine guns and four anti-tank weapons. These are organized as a machine-gun squadron consisting of a headquarters and three machine-

gun troops, each containing four Vickers machine guns, and one anti-tank troop containing four anti-tank weapons. A troop (commanded by a subaltern) consists of a headquarters and two sections, each sub-divided into two sub-sections.

2. In peace, a cavalry regiment has eight machine guns* organized as a machine-gun squadron, consisting of a headquarters and two machine-gun troops, each containing four machine guns.

3. A machine-gun troop consists of headquarters and two sections, each with two guns. It is commanded by a subaltern, with a serjeant as 2nd-in-command, and in war a second serjeant to assist in the control of ammunition supply, etc.

4. To enable the troop leader to maintain his sections in action, to guard against surprise, to follow the tactical situation and to maintain communication, troop headquarters contains troopers trained as machine-gunners, who are available for observation, orderly and scout duties. It also contains a mounted orderly (the troop leader's groom) and in war a motor cycle despatch rider.

5. The section consists of a headquarters and two sub-sections, each with one gun. It is commanded by a corporal, and its headquarters contains a range-taker and an orderly.†

6. According to circumstances, the troop or the section can be the tactical unit. The section is the fire unit for direct fire, and can be the fire unit for indirect fire if the section is acting independently. The troop is the normal fire unit for indirect fire.

7. Troops are numbered consecutively from No. 1 throughout the squadron.

Sections are numbered 1 and 2 in each troop, and sub-sections numbered 1 and 2 within each section.

3. *Infantry*

1. In war, the machine-gun company consists of a headquarters and four platoons, each with four guns.

In peace (except in the Colonies), it consists of a headquarters and three platoons.

2. The machine-gun platoon consists of a headquarters and two sections, each with two guns. It is commanded by a subaltern, with a serjeant as 2nd-in-command (platoon serjeant).

* A regiment of household cavalry has two guns organized in one section.

† In peace one No. 4 should be used as section orderly.

3. To enable the platoon commander to maintain his sections in action, to guard against surprise, to follow the tactical situation and maintain communication, the platoon headquarters contains an observer, an orderly and four scouts (two in peace). These are all trained machine-gunners.

4. The section consists of a headquarters and two sub-sections, each with one gun. It is commanded by a serjeant or corporal, and its headquarters contains a range-taker and an orderly, with a 2nd-in-command for control of ammunition supply, etc. The sub-section contains five gun numbers in war and four in peace.

5. The platoon is the smallest machine-gun tactical unit, while the section is the fire unit for direct fire. The platoon is the normal fire unit for indirect fire, but the section can be so employed when acting independently.

4. Intake and turnover

1. Men selected for posting to a machine-gun company should as far as possible be trained soldiers.

2. As the work includes carrying heavy weights, sometimes over long distances, staying power is of great importance. This fact should be borne in mind when selecting men for training as machine-gunners.

3. To ensure that units have the requisite number of machine-gunners serving with the colours to meet mobilization requirements and to replace wastage, commanding officers will, at the end of each collective training season, arrange for the following turnover :—

25 per cent. of non-commissioned officers provided they have had four years' training in the machine-gun company.

50 per cent. of private soldiers, other than batmen and the personnel of company headquarters, provided they have had two years' training in the machine-gun company.

50 per cent. of range-takers, provided they have had three years' training as range-takers.

4. In each machine-gun company the following establishment of range-takers will be maintained :—

One officer and two N.C.Os. above the rank of corporal as instructors and two lance-corporals or privates in each platoon as range-takers. In addition, a reserve of not less than two range-takers in each platoon should be trained and tested annually.

CHAPTER II

SYSTEM OF TRAINING

5. Object of training

1. The object of all machine-gun training is to ensure that, whatever the conditions of ground or visibility, accurate and safe fire support can quickly be afforded to the rifle companies throughout all phases of the battle.

2. This aim must be kept in mind during every stage of training, and all machine-gunners should be imbued with the determination to face any sacrifice in order to carry out their role in battle. This spirit will be fostered by the machine-gunner's training as a soldier, by a thorough knowledge of his duties and by confidence in the reliability of his weapon.

6. Responsibility for training

1. The instructions as to the duties and responsibilities of commanders in regard to machine-gun training contained in this section are intended to supplement those laid down in Cavalry Training, Vol. I, and Infantry Training, Vol. I, and should be read in conjunction with them.

2. *Brigade commander.*—The brigade commander is responsible that the machine-gun companies in the brigade are trained to act in co-operation with other units and arms in carrying out a fire plan. He will satisfy himself :—

- i. That the system of technical training is in accordance with the methods laid down in this volume and in the Handbook for the .303-inch Vickers Machine Gun.
- ii. That the method of tactical handling employed by battalion commanders is in accordance with the doctrine laid down in the training manuals.
- iii. That the general state of efficiency of personnel and transport is such as to fit them for service.

3. *Brigade machine-gun officer.*—In each brigade an officer will be selected for training as the brigade machine-gun officer. He will keep in close touch with machine-gun training in the units of the brigade and will be available to assist in matters affecting such training. His duties will include the preparation of test ranges for range-takers and the supervision of the range-takers' annual classification tests.

When the annual machine-gun concentration is under the brigade he will be available to assist in the organization of the concentration and the preparation of such demonstrations and schemes, etc., for Parts III and IV, annual machine-gun course, as may be necessary. The administrative arrangements for such concentrations should be in the hands of a specially appointed officer.

4. The *battalion commander*.—Is responsible that the training of the machine-gun company will fit it for the tasks it may be called upon to undertake in war. He will at all times emphasize the object to be attained and the importance of the time factor. He will ensure that the transport allotted to the machine-gun company is trained both technically and tactically. He is responsible for the turnover of personnel referred to in Sec. 4, and also that trained subordinates are available to replace their seniors.

5. The *company commander*.—Is responsible for the technical and tactical training of his company to fit it to take its place within the battalion or to act in co-operation with other units. He will ensure that the equipment placed in his charge is maintained in a serviceable condition.

6. The *platoon commander*.—Is responsible for the training of his sections and his headquarters to carry out all the tasks which may be allotted to the platoon in battle.

7. *Progressive stages in training*

1. As in all training, instruction will be continuous and progressive, being divided into two periods allotted to individual and collective training respectively.

2. The aim of individual training is to prepare the various personnel of a machine-gun platoon, both individually and as teams for the ensuing collective training and the annual machine-gun course. Particular attention will be paid to training junior officers and non-commissioned officers with a view to their becoming efficient instructors and leaders.

3. Collective training will commence with the instruction of the section, continue with that of the platoon, and close with the training of the whole company, working either within the battalion or in co-operation with other units and arms.

4. The training of all ranks in anti-gas defence must be continuous throughout their service, so that they are able to perform their duties efficiently by day or night whilst wearing the respirator.

8. *Individual training*

1. Officers and serjeants must receive a thorough training in all subjects laid down in this volume and in the Handbook of the .303-inch Vickers Machine Gun. Details and sequence of training are given in Chapter III. The serjeants will also be trained in equitation.

2. Officers and non-commissioned officers will attend a Qualifying Course at the Small Arms School, Netheravon Wing, at the first opportunity after being thoroughly trained in all subjects included in the training of the first-year machine gunner.

3. At the commencement of the individual training period the machine-gun company commander must expect to find the personnel of his company in various stages of training. He should therefore be prepared to deal with several categories. *i.e.* :—

- i. First-year officers and first-year men.
- ii. Second-year men, range-takers, scouts and transport men.
- iii. First-year officers; junior and potential non-commissioned officers for training in leadership and fire control.
- iv. Trained officers and non-commissioned officers.

The training of these categories cannot be simultaneous, as the instructors—category (iv)—will be required for (i) and (ii), and later for (iii). The arrangements for individual training should therefore be centralized under company arrangements, and the programme for the period made out accordingly. The subjects which must be included in their training are given in Chapter III.

4. In order to obtain full value from the machine guns and to husband the strength of the gun teams, the ability to manoeuvre machine-gun vehicles boldly and skilfully under fire is essential. This demands from the drivers an eye for ground and a high sense of devotion to duty. Every opportunity should therefore be taken to carry out the tactical training of drivers both during the individual and collective training periods.

5. During the individual training period, schemes should also be framed for the purpose of training officers in the application of tactical principles laid down in F.S.R., Vol. II, Infantry Training, Vol. II, or Cavalry Training, Vol. II, and the technical methods contained in the succeeding sections of this volume.

These exercises should involve reconnaissance; the rapid appreciation of a situation; the issue of tactical and fire direction orders; the preparation of reports and sketches; as well as consideration of the problems of ammunition supply.

The actual presence of machine guns on such schemes may be of value in certain cases to test the feasibility of the orders given and the time actually required to carry them out. They are not, however, essential for the conduct of the exercise.

Commanders of formations should include in their tactical schemes problems designed to exercise brigade machine-gun officers in the duties they will be called upon to carry out in war.

6. i. The weapon training of the machine-gunner will be carried out as laid down in Vols. I and IV.
- ii. In each machine-gun sub-section a proportion of the personnel is armed with the revolver. As all members of the sub-section are interchangeable, it is essential that every machine-gunner be trained in the use of this weapon.*
7. By the end of the individual training period the following stages should have been completed :—
 - i. The training of the personnel of platoon and section headquarters in their various duties.
 - ii. The instruction of the men of each sub-section in their duties.
 - iii. The instruction of leaders to control fire and sub-sections to recognize and engage targets, as well as to maintain their guns in action.

The platoon will not be considered fit to commence collective training until it has reached the above standard and individuals have completed Part II of the annual machine-gun course.

The battalion commander will carry out an inspection at this stage.

9. Collective training

1. *System.*—The company should be struck off all duties for not less than four weeks at a convenient time for collective training, including Parts III, IV and V of the annual machine-gun course. All ranks will be present during this training. The various stages to be completed during this period are :—

- i. Section training.
- ii. Platoon training.
- iii. Parts III and IV of the annual machine-gun course.
- iv. Company training, including Part V of the annual machine-gun course.

* Owing to the limited allotment of ammunition, only those armed with the revolver will be exercised with ball ammunition. (See Vol. IV, 1931, Appendix III.)

iii and iv will, at home stations, usually be carried out during the brigade machine-gun concentration. It will be found of value if the company can be given a few days' training as a whole before proceeding to their concentration camp.

2. *Programmes of training.*—The company commander must decide the time to be allotted to the various stages referred to above. He will supervise the training of his platoons in field operations and ensure that each sub-unit is fit to proceed to the next higher stage of training. The following instructions will be taken as a guide in preparing programmes for collective training :—

i. General.—

- (a) All exercises should include both technical and tactical lessons.
- (b) Normally the tactical lessons to be taught will be made known to all ranks before the exercise starts.
- (c) The technical lessons will be brought out by instructional criticism during and after the exercise.

ii. Section training—will include the following tactical lessons.

- (a) The action of a section in attack or defence with the roles of :—
 - Forward guns.
 - Supporting guns.
 - Operating independently.
- (b) The action of a section forming part of a rear guard.
- (c) The occupation of section positions by night.

iii. *Platoon training.*—The tactical lessons to be included in platoon training fall under similar headings to those for a section given in (ii) above, but the exercises will also be framed to bring out the handling of the platoon as a whole, and will include the occupation of indirect fire positions.

The difficulties which attend the supply of ammunition in the field make it most important that practice be carried out with the full complement of platoon and a portion of company transport.

iv. *Parts III and IV, Annual Machine-Gun Course.*—(See also Vol IV, 1931, Sec. 16.) These will be fired on a battle practice range. The objects of these practices are :—

- (a) To instruct all ranks in the approved principles of machine-gun fire and in the application of machine-gun tactics in the field, using service ammunition.
- (b) To accustom commanders to make rapid appre-

ciation, quick decisions, and to issue such orders as will ensure their intelligent and rapid execution.

The schemes should deal with problems such as are likely to confront a junior commander in war. They will normally be drawn up by the company commander, under the supervision of the commanding officer, who should be present during the exercises and act as director.

Where several machine-gun companies are concentrated, it may be more convenient for such schemes to be drawn up under brigade arrangements.

- v. *Company training*.—This will consist of schemes designed to exercise the company as a whole. It may be carried out under company, battalion, or in some cases brigade arrangements, and will include Part V of the annual machine-gun course. (See also Vol. IV.)

The training of the company is continued during the battalion training period.

3. *Brigade exercises*.—The brigade commander will test the efficiency of his machine-gun companies, when concentrated, during Part V and during brigade training. Problems designed to instruct the brigade machine-gun officer in his duties in the field will be included in these exercises.

The object of brigade exercises is to train the machine-gun companies to take part in any operation involving co-operation with other units and arms. To achieve this, schemes should include :—

- i. The allotment and interchange of roles and the distribution of fire in accordance with the fire plan and the progress of the fight.
- ii. Co-operation with other arms, and the responsibilities of the brigade machine-gun officer in this respect.
- iii. Intercommunication and the supply of ammunition.

If arrangements cannot be made to carry out tactical training with other arms, the action of these arms and its effect must be considered in the solution of each problem.

CHAPTER III

INDIVIDUAL TRAINING

10. *System of training*

In order to render the personnel of a machine-gun platoon fit both individually and as a whole to take its part in collective training, instruction in the undermentioned subjects will be given during the individual training period :—

- i. *Special machine-gun subjects*, taught individually to N.C.Os. and men, viz. :—mechanism, maintenance of the gun in action, aiming, indication and recognition of targets, use of instruments, fire discipline, ranging, fire control, packing limbers, machine-gun signals. (See Handbook for the .303-inch Vickers Machine Gun, and subsequent sections of Chapter III and Part II of this volume.)
- ii. *Elementary gun drill, section and platoon drill*, by which individuals learn to carry out correctly those duties which do not vary with ground or circumstances, and must become second nature to enable gun detachments, sections and platoons to work together in battle. (See Chapter IV.)
- iii. *Field duties*, in which those duties which vary with the ground, situation and tactical role of the platoon are taught and practised, and those learned during (ii) above are applied to the ground. (See Chapter V.)

11. *Sequence of training*

1. *General considerations* :—

- i. Certain of the above-mentioned subjects will be taught concurrently and by stages. Some must be taught individually and practised collectively. The table on page 14 gives the stages suggested for various subjects.
- ii. The details of the fire orders and fire discipline will be practised with the drills.
- iii. Packing of limbers will be taught individually, but the action of loading and unloading will be practised as in the drill "Prepare for action" both for direct and indirect fire.
- iv. Advanced instruction in mechanical subjects and fire orders will be given concurrently with section and platoon drills.

TABLE OF STAGES OF INSTRUCTION

Stage	Drill	Special machine-gun subjects		Firing
		Miscellaneous	Mechanical	
1st	—	—	<i>All references are to Handbook '303-inch Vickers Machine Gun, 1930.</i> General description (Sec. 4).	Demonstration on 30-yards range to illustrate general description and some characteristics.
2nd	Elementary gun drill. (Up to and including action.)	Aiming instruction. Instruments (except zero post and clinometer). Visual training (beyond 800 yards). Recognition.	Mechanism (Secs. 22, 23, 24). Care and cleaning (Secs. 40, 41). Stripping (Secs. 53, 56, 57).	—
3rd	Elementary gun drill (concluded). T.O.E.D.	Fire discipline. Fire orders. Packing limbers. M.G. Signals.	Repairs and adjustments (Secs. 81, 82, 85). Immediate action (pp. 110-117, Cols. 1 and 2 only). Care and cleaning (Secs. 44-52). Spare parts (Secs. 61, 62, 63).	—
4th	Section drill—Direct fire.	Fire orders. Instruments (zero post and clinometer). Belt filling. Mounting gun, reference ground and cover. Ranging.	Stripping (Secs. 54, 55, 58). Repairs and adjustments (Secs. 78, 83, 84). Blank firing attachment (Sec. 19A).	Part I, A.M.G.C.
5th	Platoon drill—In - direct fire.	Night-aiming instruction.	do.	—
6th	Section drill—Night firing.	—	do.	—
7th	—	Use of pack saddlery.	Mechanism (Secs. 25-35). Cause of stoppages (pp. 110-117, Col. 3). Special stoppages (Sec. 72).	Part IA, A.M.G.C.

v. Instruction in the use of instruments must be completed before commencing "Platoon Drill—Indirect fire."

2. Gun numbers:—

i. *First-year men* will be trained in all gun numbers' duties up to the standard required to enable them to pass their tests of elementary drill and take their place in the sub-section. To enable them to reach this standard, instruction will include the subjects mentioned in the table referred to in paragraph 1, above, stages 1 to 6 inclusive. They will also be exercised in Part II, Table I, of the annual machine-gun course. (See Vol. IV.)

The minimum time required for this instruction is seven weeks. A programme suitable for the first-year men's course is given in Appendix I.

ii. *Second-year men* will be trained to reach a higher standard in the same subjects as taught to the first-year men, and will receive instruction in subjects mentioned in paragraph 1, above, stage 7. They will also be exercised in Part II, Table II, of the annual machine-gun course. (See Vol. IV.)

3. Range-takers, scouts, etc.:—

i. Range-takers, observers, orderlies and scouts, in addition to being trained as gun numbers, will require instruction in their special duties.

Range-takers will be trained in accordance with the instructions laid down in Sec. 21, and observers, orderlies and scouts as specified in Infantry Training, Vol. I. Orderlies will also be trained to carry out certain technical duties in the field (see Chapter V), and observers will be instructed in the use of the telescope.

ii. Drivers of limbers or other vehicles will be trained as such and in the use of ground. As far as possible, they should also be trained as machine-gunners.

Instruction in horsemastership, equitation and driving will be carried out in accordance with the instructions contained in the Manual of Horsemastership, Equitation and Driving.

4. *Officers and N.C.Os.*—All officers and N.C.Os. must have a thorough knowledge of the subjects referred to in Sec. 10, so that they may be capable of training and leading their men.

i. First-year officers and potential N.C.Os., who have completed a course as for first-year men, will undergo a short course of about two weeks in fire control and leadership. (See Appendix I.)

ii. Officers and N.C.Os. will also receive training in :—

- Reconnaissance of section areas.
- Issue of orders to a section.
- Tactical handling of sections.
- Fire control.
- Use of slide rule.
- Inspection of equipment.
- Testing clinometer.

iii. Officers and senior N.C.Os. will, in addition, be instructed in :—

- Selection of platoon areas.
- Issue of orders to a platoon.
- Tactical handling of platoons.
- Fire direction.
- Advanced fire control.
- Use of director and plotter.
- Testing director.

5. *Headquarters.*—The action and duties of the personnel of platoon and section headquarters in coming into and out of action are laid down in Chapter V. The procedure must be applied to each case, according to the tactical situation, the role given to the platoon and the ground.

Before starting collective training, platoon and section headquarters should be thoroughly grounded in this procedure by means of exercises without the gun numbers, both on the sand table and on the ground. This training can be carried out at a time when the remaining personnel of the company are otherwise employed. The sequence should be :—

- i. Training of N.C.Os. in the selection of section areas and gun positions, and in use of cover.
- ii. Sand table exercises to teach the procedure for bringing platoons and sections into and out of action. This will include reconnaissance by the platoon commander and the issue of his orders together with the action of the scouts and observer; the action and orders of the section commanders, section corporals and the duties of the range-takers.
- iii. Simple section and platoon exercises will be arranged initially on the sand table, and subsequently on the ground. Exercises should commence with an opening situation presenting a task for a machine-gun section or platoon as the case may be.

The consequent action of the subordinates should be gone into in detail and criticized. When carried out on the ground each man will act in accordance with the orders and situation.

12. *Setting sights and laying an aim*

1. Instruction in this subject will be given before reaching the heading in elementary gun drill, "To adjust the sights and lay the gun." (Sec. 24, 12.)

It is assumed that the soldier will have been trained to aim with a rifle.

2. *Stores required.*

Gun, tripod, belt box, bar foresight, aiming post and a landscape target.

3. *Setting the sights.*

The instructor will explain and demonstrate :—

- i. The use of the sights to obtain direction and elevation.
- ii. The method of adjusting the sights. Fifty yards will be taught as the smallest adjustment.
- iii. That the correct line on the graduated plate for any particular range is the one **under** the figures indicating that range.
- iv. The fixed sight will be used up to 500 yards inclusive. The men should be required to make several adjustments.

4. *Rules for laying an aim.*

The reasons for taking a correct aim must be thoroughly understood. (Vol. I, 1931, Sec. 26, *Lesson I*, 3.)

The instructor will explain the following rules :—

- i. Sights must be upright. This is ensured by correct mounting of the tripod.
- ii. The eye should be as close to the aperture as possible.
- iii. The firer must look through and not at the aperture.

5. *Methods and sequence of instruction in laying an aim.*

i. The instructor will lay a correct aim at the aiming post *without* "holding." Whilst laying, the chin must be supported on the hand. A belt box may be placed across the knees and the elbows rested on the box, or the box may be placed on the ground resting on end, and the arms rested on top.

He will explain that direction is obtained by tapping the traversing handles, and elevation by turning the wheel.

ii. Every man should view the aim, and in turn lay the gun, without holding.

Should any faults be detected, the instructor will explain their effects, and ensure that such faults are remedied.

If a man's aim is incorrect, he must be convinced that it is so. (Vol. I, 1931, Sec. 26, *Lesson I*, 4.)

iii. The men will be taught to lay an aim *with* "holding." The tripod must be in good condition, otherwise there will be

considerable difference in aim with and without holding. There should be little difference.

iv. Practice will be given in laying an aim with the bar foresight affixed.

v. Progressive instruction will be given in laying an aim at points on a landscape target, and finally on natural objects.

vi. Instruction will be given in noting a point of aim to the right or to the left of the original mark.

The instructor will tap the gun off and ask the man to describe where the gun is laid.

vii. Instruction will be given in selecting and noting a point of aim immediately above or below the target by moving the tangent slide up or down.

Instruction in (vi) and (vii) leads up to subsequent instruction in the use of auxiliary and gun aiming marks. (See Sec. 70, 10, i.)

13. Indication and recognition. *Instruction in fire orders*

(To be read in conjunction with Vol. I, 1931, Chapter V.)

1. It is necessary in certain respects to extend the procedure laid down in Vol. I of this manual for the indication and recognition of targets by machine-gun personnel. This is due to the range of the gun, its flexibility, and the fact that, when engaging targets with width, an exact point of aim must be indicated to the firer. Owing to the close grouping of machine-gun fire, even small inaccuracies may result in total loss of fire effect. Further, since machine-gun fire is often delivered under conditions where safety has to be considered, a wrong point of aim may result in danger to our own troops.

2. Arc of fire.

The area of ground to be watched, and within which targets will be engaged, is known as the arc of fire.

The arc is bounded by the "right of arc" and "left of arc," each limit being an imaginary line passing through the gun position and some easily described point on the landscape in the direction required. Similarly an imaginary line, known as the "near limit of arc," can be described from right to left across the area to indicate that only the ground beyond this line and within the limits mentioned above need be considered.

3. Indication and recognition.

i. *Without aids.* (Vol. I, 1931, Sec. 47, 3, 1st stage.)

- (a) Whenever possible the gun itself will be laid on to the point to be recognized. This is the simplest and most direct method of indication.

Similarly an instrument, for example a director, or "pointer" can often be used.

- (b) The approximate right, centre, or left of arc can be of great assistance to denote a general direction, viz:—

"Right of Arc—White House." "Centre of Arc—Bright Yellow Patch—Top Right Corner."

ii. *With aids.* (Vol. I, 1931, Sec. 47, 3, 2nd stage, and 4.)

- (a) Reference points (Vol. I, 1931, Sec. 47, 4, i).

Reference points in a machine-gun arc may be as far apart as 30°.

In deciding on the number of reference points, the objects to be employed, and their distance apart and from the guns, the fire controller must consider the nature of the arc of fire and his task. As a general rule, as few as possible should be used, so as to avoid confusion. They should be in the areas where targets may be expected to appear. When the enemy is tied to definite lines of approach, or moving targets are likely, it may be necessary to choose a few reference points close together to facilitate rapid switching.

The points originally used for describing the right or left of arc should not be employed as reference points unless specially named as such.

- (b) Degree measurement (Vol. I, 1931, Sec. 47, 4, iii).

Fire controllers should measure horizontal and vertical angles by means of the gratitudes in their field-glasses. If for any reason it is necessary for them to use hand angles, it should be remembered that they will normally be in the lying position. Therefore, when their individual hand angles are being determined, these should also be checked lying down.

At the gun, degrees included in an indication will normally be measured by hand angles.

If the target is difficult to indicate, the fire controller may order vertical and horizontal angles to be measured by means of the elevating hand-wheel or gun dial or both.

The following methods may be employed:—

Using the handwheel only.

To be employed when there is a prominent mark directly in line with the target, but above or below it.

The section commander orders the range or ranges required to hit the target, and indicates the prominent mark for the guns to lay on.

With his glasses he measures the difference in angle of sight between the prominent mark and the target.

He orders Nos. 1 to elevate or depress the guns by means of the elevating handwheel through this amount.

The order will be given in the form **Hand-wheel—Up (or Down)** . . . deg. . . . mins. He then orders :—

“Realign Line of Sight On. . . .”

Nos. 1 realign their line of sight on the prominent mark by moving the tangent sight slide. The mark is then used as an auxiliary aiming mark.

Using the dial and handwheel (if required).

To be employed when there is no mark directly in line with the target.

The section commander chooses a suitable mark as close to the target as possible.

He measures with graticules the horizontal angular amount the target is right or left of the mark, and the vertical amount the target is above or below the horizontal line through the mark.

He gives out the range or ranges to hit the target, indicates the mark and orders **“Dials.”**

Nos. 1 adjust their sights to the range and lay on the mark. Nos. 2 set the dials at zero.

The section commander orders :—

“Right (or Left) . . . deg. . . . mins.”

“Up (or Down) . . . deg. . . . mins.”

The guns are moved through the angles ordered by use of the dials and elevating handwheel respectively.

The section commander then orders an actual point of aim, e.g. **“Patch of brown grass.”**

(c) Combination of vertical clock ray and degree measurement. (Vol. I, 1931, Sec. 47, 4, iv and v.)

The indication of the ends of a target with width requires particular attention.

The insertion of the word **“From”** before the description of one end of the target and **“To”** before the description of the other, will normally suffice to indicate the limits of the targets.

Example :—

Centre of Arc—Bush—From Bush to Right—Five o'clock—Three Degrees—Tree.

If the indication is difficult, this may not always be possible, and the words **“From”** and **“To”** would have to be used as in the following example :—

Centre of Arc—House—Left, Small Bush—Left, Gap in Hedgerow—Slightly Left and Below, Faint Dark Mark—From Bush to Mark.

In such an indication, to avoid misunderstanding, the words **“Right limit”** and **“Left limit”** may be used to indicate the flanks. The above example would then be :—

Centre of Arc—House—Left, Small Bush—Right Limit—Left, Gap in Hedgerow—Slightly Left and Below, Faint Dark Mark,—Left Limit.

4. Sequence and system of training.

The following will be the sequence of individual instruction :—

i. Officers and N.C.Os.

Visual training.

The organization of the arc, including the use of range cards.

Indication.

Fire orders.

ii. Gun numbers.

Visual training.

Judging distance up to 1000 yards.

Recognition.

Application of fire orders.

iii. The observers, range-takers, scouts and orderlies will require instruction in visual training and elementary indication and recognition on the same lines as for officers and N.C.Os.

5. Individual instruction of officers and N.C.Os.

i. Visual training.

This should be confined first to the recognition of natural and artificial features and the general character of the country ; next, the importance of these features should be pointed out with reference broadly to the attack and the defence of the area in which they lie ; and, finally, attention should be called to those which are of particular interest to the machine

gunner, *e.g.* positions for observation to the front and to the flanks, positions that offer a good field of fire, areas on which observation of fire is likely to be obtained, localities from which enemy attacks may develop, the visibility of sky-lines, etc. By such practice a necessary introduction will be obtained to the more detailed study of cover, reconnaissance, and the selection of gun positions.

Practice in the use of glasses should be combined with the above.

ii. *The organization of the arc and use of range cards.*

Instruction should be given having regard to a tactical situation. Particular attention should be paid to the choice of reference points, to the orders to be given to the range-taker, and to estimating ranges from the key ranges on a range card.

iii. *Indication.*

The sequence of instruction will be as laid down in Vol. I, 1931, Sec. 47, the instructional stores and technical methods involved being adapted to machine-gun requirements. For example, directors may be used instead of aiming rests.

iv. *Fire orders.*

As soon as a satisfactory standard of indication has been reached, officers and N.C.Os. will be practised in giving out fire orders for various targets. Landscape targets may be used in the preliminary stages. Examples of direct fire orders will be found in Sec. 72.

During the later stages of this training the time taken to give out the fire order will be noted, and, when necessary, it will be pointed out where time could be saved. This will be of particular importance in the engagement of moving targets.

The detail of fire discipline in connection with fire orders is practised in Section drill—Direct fire (Sec. 26).

6. **Individual instruction of gun numbers.**

i. *Visual training.*

As in Vol. I, 1931, Sec. 46, extended to suit machine-gun requirements.

ii. *Judging distance up to 1000 yards.*

The men will be taught to recognize ranges of 600 yards and 1000 yards, and to judge from these the intervening ranges.

iii. *Recognition.*

Instruction in recognition must only be given by N.C.Os. who have reached a high standard in indication.

The sequence of instruction will be as laid down in Vol. I, 1931, Sec. 46, landscape targets or the miniature range being used in the preliminary stages or during inclement weather.

During this instruction the Nos. 1 will be at the guns, and on the conclusion of the indication will be ordered to lay on the point of aim indicated. The instructor will check the point of aim. Not more than four guns should be used at one time by one instructor.

iv. *Fire orders.*

As soon as a satisfactory standard of recognition has been reached, the men will be practised individually in the detail of fire orders.

14. *Instruction in instruments, dials, etc.*

1. **General remarks.**

i. All ranks of the machine-gun company must be proficient in the use of the following:—

Bar foresight.

Aiming post.

Zero post.

Direction dial.

Elevating wheel.

Clinometer.

ii. Officers and N.C.Os. must be proficient in the use of the slide rule. The former and senior N.C.Os. will also be trained to use:—

Director.

Plotter.

iii. In addition to the above, all officers and N.C.Os. should be able to determine whether a clinometer is in adjustment. Similarly, those officers and N.C.Os. who are trained in the use of the director should be able to test the instrument for accuracy.

The detail of the tests is laid down in the Handbook for the .303-inch Vickers Machine Gun.

If an instrument is found to be out of adjustment, it must be adjusted by a qualified armourer only.

2. **Method and sequence of instruction.**

i. The various instruments will be explained and their employment demonstrated.

ii. The personnel concerned will be practised in the use of the instruments.

1st-year machine gunners must reach a reliable standard of accuracy. For the standard to be reached by fire controllers and 2nd-year machine gunners, see T.O.E.D. (Sec. 25).

3. **Deflection Bar Foresight. Mark I.**

i. *Description.*—See Handbook for the .303-inch Vickers Machine Gun, 1930 (Supplement No. 2), Sec. 1.

The following will be explained to the man :—

The graduations on the bar, the pointers, and the markings **R** and **L**.

The graduations on the upper surface of the bracket.

The sliding sight and clamp screw.

The clamp screw on the bracket.

ii. *To affix the bar foresight.*

Gun mounted, No. 2 kneeling on right of gun with bar foresight in pouch, slung over left shoulder.

No. 2 will remove the bar foresight from the pouch, seeing that it is set at zero. He will place it over the foresight protecting wings of the gun, and, being careful that the spring stud engages in the opening on the right wing, will tighten up the clamp screw of the bracket.

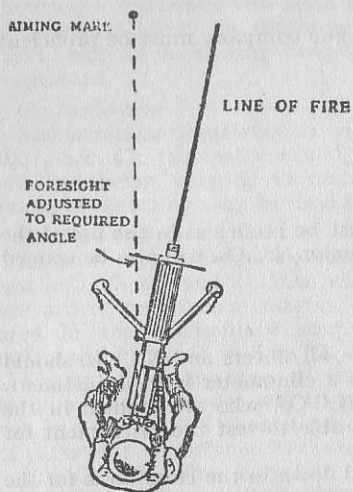


Fig. 3.

iii. *To lay off an angle of direction by means of the bar foresight.* (Fig. 3.)

Gun mounted, with bar foresight affixed, and laid on an aiming mark. No. 2 at the gun.

No. 2 will adjust the bar foresight in accordance with the deflection given.

It should be noted that the sight is moved in the opposite direction to that ordered, *i.e.* if **right** is ordered the foresight is moved to the **left**.

Adjustments to be made to within two minutes, but to be ordered to nearest five minutes.

When the bar foresight is replaced in its pouch, it will be set at zero.

4. **Aiming Post M.G. Mark I.**

i. *Description.*—See Handbook for the .303-inch Vickers Machine Gun, 1930 (Supplement No. 2), Sec. 2.

The following will be explained to the man :—

The telescopic portion.

The collar on the inner rod.

The bracket.

ii. *To plant the aiming post.*

The gun will be mounted and laid, with any quadrant angle. The bar foresight will be affixed. No. 1 at gun, No. 3 eight yards in rear with aiming post. The instructor may act as No. 1.

No. 1, without moving the gun, runs the tangent sight slide to 2500 yards. No. 3 moves up to the gun and looks over the sights, to ascertain the approximate position for the aiming mark. He will then plant the post not less than five yards in front. No. 1 will direct No. 3 by signal to move the post until the line of sight is at 6 o'clock on the aiming mark.

No. 3 should place the aiming mark on the ground or plant the post vertically. If this is not feasible, the foot of the post should be driven firmly into the ground sufficiently far to one side to admit of full use being made of the telescopic portion.

This should be practised with and without bar foresight affixed.

5. **Zero Post M.G. Mark I.**

i. *Description.*

This post is 3 feet long; it has a ring 4 inches in diameter at the upper end, and the lower end is pointed.

ii. *To plant the zero post.*

Gun mounted and laid with any quadrant angle, bar foresight affixed. No. 1 at gun, No. 3 eight yards in rear with zero post. The instructor may act as No. 1.

Nos. 1 and 3 act in the same manner as when planting the aiming post.

The zero post will be planted so that the line of sight is on the point where the ring joins the stem. If it cannot be planted upright it will be planted leaning sideways.

Care must be taken not to bend the zero post, and that it is planted in such a way that it will not be struck by fire from any gun in the fire unit.

6. **Direction Dial. Mark II.**

i. *Description.*—See Handbook for the .303-inch Vickers Machine Gun, 1930, Sec. 12, 9.

The following will be explained to the man :—

The graduations.

The markings "**R**" and "**L**."

The pointer.

The clamping screw.

ii. *To set the dial at zero.*

Gun mounted and laid on aiming mark. No. 2 kneeling on right of gun.

No. 2 loosens the clamping screw, rotates the dial until 0 is opposite the pointer, and then screws up clamping screw.

No. 2 should be practised in setting the dial at zero, both in the kneeling position and lying down. When lying down it must be done with as little movement as possible.

iii. *To lay off an angle of direction by the dial.*

Gun mounted, laid on an aiming mark, and direction dial set at zero. No. 2 at gun.

No. 2 loosens the traversing clamp and swings the gun so that the pointer moves towards "R" or "L" as ordered. He adjusts the pointer to the number of degrees or minutes ordered and tightens up the traversing clamp.

No. 2 must be practised both kneeling by the gun and lying down. When lying down it must be done with as little movement as possible.

Switches should be given out in multiples of ten minutes, and adjustments made to within ten minutes.

7. **Elevating wheel.**

i. *Description.*—See Handbook for the .303-inch Vickers Machine Gun, 1930, Sec. 9.

The graduations on the rim of the wheel will be explained to the man.

ii. *To elevate or depress the gun.*

Gun mounted and laid on an aiming mark. No. 1 at gun.

No. 1 will elevate or depress the gun the necessary amount by means of the wheel.

This will be practised with and without the bar foresight affixed.

When the bar foresight is not affixed the gun will be laid on an aiming mark, with any elevation on the sights. No. 1 will **not** realign his line of sight on the aiming mark.

When the bar foresight is affixed, the gun will be laid on an aiming post with the sights at 2500 yards. On completion No. 1 will realign his line of sight on the aiming mark.

8. **Clinometer, Vickers .303-inch M.G. Mark I.**

i. *Description.*—See Handbook for the .303-inch Vickers Machine Gun, 1930 (Supplement No. 2), Sec. 4.

The following will be explained to the man :—

The graduations on the cradle and micrometer collars.
Method of adjustment by milled head and quick release.

The arrow on the base.

ii. *To place elevation or depression on the gun by means of the clinometer.*

Gun mounted approximately level. No. 2 kneeling on

right side of gun, clinometer in its case, set at zero, slung over the left shoulder.

No. 2 removes the clinometer from the case and sets it at the angle ordered. He places it, with the arrow to the front, on the side plates of the breech casing of the gun. It should be placed so as not to foul either the trigger bar lever, or the tail of the trigger. By moving the elevating wheel No. 2 centralizes the spirit bubble.

The clinometer will be set at zero when it is no longer required. At other times it will be left at the setting ordered.

Order to be given to nearest five minutes. Adjustments will be made to nearest two minutes.

iii. *To ascertain the quadrant elevation on the gun.*

Gun mounted and laid at any angle of elevation or depression. No. 2 kneeling on right side, with the clinometer set at zero, in the case, slung over the left shoulder.

No. 2 takes clinometer from case and places it on the side plates of the breech casing of the gun, arrow pointing to the front. He turns the milled head until the bubble is central, removes the clinometer and takes the reading.

Clinometer to be read to nearest five minutes.

9. **Director No. 4. Mark II.**

i. *Description.*—See Handbook for the .303-inch Vickers Machine Gun, 1930 (Supplement No. 2), Sec. 5.

The following will be explained to the officer or N.C.O. :—

The focussing of the telescope.

The pointer.

The degree scale on the director.

The spirit level and elevating gear.

The degree scale plate.

How to clamp the index plate, and the functioning of the clamping screw.

Use of spirit levels on stand ; and

Hook attached to the base plate.

ii. *To set up the director.*

Remove the director and stand from their cases.

Fit the base of the director into the carrier.

Splay out the legs of the stand so that the director is at a convenient height. It will be found that the kneeling position is the most suitable, but a lower position may have to be adopted. Press the legs firmly into the ground. Make sure that the degree scale plate is approximately level.

iii. *To take an angle of sight.*

Focus the telescope. Unloosen the clamping screw. By means of the elevating gear and milled portion of the clamping socket lay the tip of the pointer at 6 o'clock on the target.

By means of the milled head, below the depression micrometer head, level the bubble. Read the angle of sight by means of the degree scale and micrometer heads.

Once the bubble has been levelled, the reading of the angle of sight may be taken later at any convenient time. Readings to be to the nearest minute.

When finished with, the arrows will be set at zero.

iv. *To measure a lateral angle between two points.*

Set the pointer on the index plate opposite "ZERO" on the degree scale.

Tighten up the clamping nut. By means of the elevating gear and milled portion of the clamping socket, lay the pointer at 6 o'clock on the first point. Tighten up the clamping screw.

Loosen the clamping nut and lay the pointer on the second point.

Read off the number of degrees, minutes, and direction, right or left, from the degree scale to the nearest minute.

Ensure that the degree scale does not slip when the index plate is moved. Always move the index plate by holding the carrier bracket, and not the director.

Before putting the director stand in its case, set the slide horizontal, clamp the compass, and set the pointer on the index plate at 180 degrees.

10. Field Plotter. Mark IV.

i. *Description.*—See Handbook for the .303-inch Vickers Machine Gun, 1930 (Supplement No. 2), Sec. 8.

The following will be explained:—

Scales on base.

Range arms.

Protractors.

Use of clamping screws.

ii. *To use the field plotter.*

The field plotter is used to solve triangles. From it, given two sides and the included angle, the other angles and the third side can be found.

This field plotter is primarily an artillery instrument. Only a few ranges suitable for machine guns are given on the range arms.

For lower ranges it is necessary to double or further multiply them.

When the range is multiplied, the base must be similarly multiplied.

In the triangle TOG, Fig. 4, suppose OG to be the base (600) and suppose TO to be the range (1600), and the angle TOG to be 110° .

To find TG and the angle TGO.

As the range 1600 is too small to go on the range arm it must be doubled, and consequently the base must also be doubled.

Loosen all clamps and draw out the slides on the base until the arrow on the right of the protractor can be set at 120° .

Clamp up the clamping screw on the base.

Move the arrow on the slide of the range arm to 3200 and clamp up the upper screw. Move the range arm until the arrow on it is opposite 110° on the protractor. Clamp up the lower screw.

Reverse the plotter. Read the angle TGO from the other protractor ($52^\circ 40'$) and TG from the range arm (3790). As the range was doubled, the range read off the range arm must be halved. TG is therefore 1895 or 1900 yards.

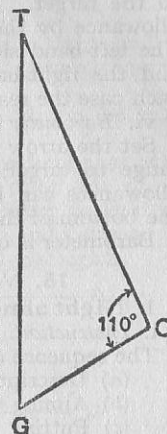


Fig. 4.

11. Slide Rule M.G. Mark I.

i. *Description.*—See Handbook for the .303-inch Vickers Machine Gun, 1930 (Supplement No. 2), Sec. 7.

The following will be explained:—

Scales.

Arrows.

Range tables.

ii. "Range to Target" and "Range to Own Troops" scale.

For use of these scales, see Sec. 67, 5.

iii. Degree scale.

In addition to being used in conjunction with "Range to Target" and "Range to Own Troops" scale (Sec. 67, 5), this scale can be used for measuring angular widths when the rule is held at the length of the cord from the eye. The amount of the slide projecting at the top of the rule will cover on the ground the degrees and minutes shown opposite the arrow on the top right corner of the slide.

iv. V.I. Scale.

With a known V.I. and H.E. the angle subtended can be found by setting the H.E. on the sliding scale opposite the V.I. on the fixed scale. The angle can be read opposite the pointer on the right of the slide. The V.I. or H.E. can be found in a similar manner when the remaining factors are known.

v. *Wind scale.*

Place the arrow marked "Wind on reverse" to the range to the target. Turn the slide rule over and read the wind allowance by the arrow in the recess at the top of the rule. The left-hand side of the slide gives readings for side winds and the right-hand side gives readings for head winds. In each case the readings are for winds of 20 m.p.h.

vi. *Barometer and temperature scale.*

Set the arrow marked "Temp. and Bar. on reverse" to the range to target. Reverse the slide rule, and the necessary allowances can be read opposite the arrow in the recess at the bottom of the rule.

Barometer is on the left and temperature on the right.

15. Night aiming and use of aiming lamp**1. Night aiming.**i. *Instruction.*

The sequence of instruction will be as follows :—

- (a) Description of the night sights.
- (b) Aiming with the sights.
- (c) Putting on corrections by the wheel, and with the foresight.
- (d) Traversing, using the sights.

Practice will be given first by day and then in the dark.

Initially glasses, night practice, may be used, but it is only by constant practice in actual darkness that proficiency can be attained. A dark room or shed which can be illuminated quickly is an advantage, as faults in aiming can be shown by turning on the lights.

ii. *Night sights.*

- (a) These are carried in the aiming lamp box. A detailed description of the sights is given in Handbook for the .303-inch Vickers Machine Gun, 1930 (Supplement No. 2), Sec. 6.
- (b) The instructor will explain the method of attaching the foresight and the sighting features.

If point H (Fig. 5) is originally laid at 6 o'clock on an aiming mark, alterations can be made by means of the elevating and traversing gear so that other points on the foresight are laid at 6 o'clock.

From H to E gives 30' elevation.

to G	„	1°	„
to D	„	1° depression.	„
to B	„	1° 30'	„
to A	„	2°	„
to J	„	30' traverse.	„
to F	„	1°	„

- (c) The instructor will explain the method of attaching, and the features of, the backsight.

iii. *To lay an aim with the night sights.*

- (a) Instruction in aiming with the night sights will be carried out in the same sequence as aiming instruction. (Sec. 12, 5.)

The aim with night sights will always be taken on a bull's-eye.

- (b) The No. 1 will be taught to place the forefinger of the left hand on top of, and at the right side of, the backsight. This is necessary in order to shut out light from the lamp over the top and between the backsight and the stem of the tangent sight.

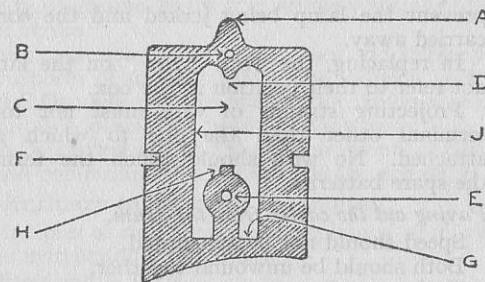


Fig. 5.

iv. *To correct the line of sight by the elevating wheel.*

No. 1 will make the necessary correction on the wheel, and will then realign point H (Fig. 5) on the foresight on to the bull's-eye of the aiming lamp.

v. *To correct the line of sight by the foresight.*

No. 1 moves the wheel so that a different point on the foresight, according to the correction ordered, is at 6 o'clock on the bull's-eye.

To obtain 1° depression, point D (Fig. 5) must be at 6 o'clock on the bull's-eye, and not on the top of it.

vi. *To traverse, using the night sights.*

Practice will be given in traversing right and left, checking the deflection ordered by means of the foresight.

2. Use of night aiming lamps.

The sequence of instruction will be :—

- i. The description of the lamp and demonstration of its use.

- ii. Practice in planting and removing the lamp. (See Section drill—Night firing, Sec. 28.)

3. Aiming lamps.

i. These are carried in the aiming lamp box. A detailed description is given in Handbook for the .303-inch Vickers Machine Gun (Supplement No. 2), Sec. 9.

ii. The instructor will explain and demonstrate the following :—

(a) *Removal from, and replacement in, the box.*

The folding handle on the side of the box must be opened out before the box is opened.

In removing the lamp it is necessary to take the lamp in one hand and the cable in the other, to prevent the lamp being jerked and the connections carried away.

In replacing, the word "TOP" on the lamps does not refer to their position in the box.

Projecting strands of wire must not touch any terminal other than the one to which they are attached. No wire should touch the terminals of the spare batteries.

(b) *Paying out the cables from the drum.*

Speed should not be attempted.

Both should be unwound together.

No loose coils of cable should be allowed to loop round the ends of the drum.

(c) *Method of attaching the lamp to the aiming post.*

(d) *Lighting, dimming and extinguishing the lamps.*

The method of using the switch.

The switch must be turned off before the lamps are replaced in the box.

16. Instruction in observation of fire and ranging

1. The principles to be followed in observation of fire and ranging are set out in Sec. 45.

2. Personnel will require training as follows :—

Officers and N.C.Os.—To observe and correct the fire at all machine-gun ranges, using field-glasses when necessary.

All ranks.—To observe and correct fire, using the naked eye up to ranges of 1000 yards.

Observer.—To observe fire, using the telescope, and to report the position of the strike.

Preliminary instruction, without ball ammunition, will be given first in observation of fire, and then in ranging. Finally,

all ranks will be instructed in ranging, ball ammunition being employed.

3. Preliminary instruction in observation of fire.

This will include the following, that for other ranks being confined to ranges of 1000 yards and under.

i. Explanation of principles.

ii. Demonstration of the size of the beaten zone at various ranges on flat ground, and of the effect of ground on the beaten zone.

If these demonstrations cannot be given with ball ammunition, the dimensions can be marked with flags placed on the ground at suitable ranges, or with models on the miniature range.

iii. Study of ground likely and unlikely to give observation of strike.

iv. Training in the use of field-glasses and telescope for the purpose of observation. In addition, officers and N.C.Os. will receive instruction in the selection of suitable observing posts, having regard to the task to be carried out and the requirements of concealment and communication. (Secs. 31, 5, and 68, 6.)

4. Preliminary instruction in ranging.

The principles of ranging will be explained to all ranks.

Further instruction will include :—

For officers and N.C.Os.

Ordering suitable corrections to a fire unit.

For other ranks.

The correction, by the firer, for direction and elevation, of the fire of a single gun. The registration of the direction and elevation required to hit the target.

i. Officers and N.C.Os.

The instruction is best carried out on the miniature range, otherwise a sand table or model placed at some yards from the observer, and at a suitable height, may be employed. Finally, some instruction should be given in the open country.

The instructor assumes errors in direction and elevation, and indicates the position of the beaten zone, or some portion of it, to the fire controller. The latter orders a correction, and the instructor will indicate a new portion of the beaten zone. This procedure is continued until the instructor considers fire effect is being obtained.

This instruction, in the later stages, should be combined with training in fire orders.

ii. Other ranks.

The man will first be taught to correct for elevation only,

and then for direction only. Finally, he will be taught to correct for both direction and elevation.

(a) *Elevation* :—

- (i) The instructor orders the firer to lay on a mark on the miniature range, or on a landscape target, and orders "Fire."
- (ii) The instructor assumes an error in elevation, and indicates the supposed position of the bullets beyond or short of the target.
- (iii) The firer, using the elevating handwheel, will depress or elevate the gun 20'.
- (iv) The instructor will indicate a new position for the shots. If the new position of the bullets has bracketed the target, *e.g.* if at first they were beyond the target, and are now short of it, the firer will make an adjustment of 10' (in this case elevation), so as to halve the bracket. If the target has not been bracketed, the firer will depress or elevate the gun a further 20' and so on until a bracket has been obtained. When a final adjustment has been made, the instructor will inform the firer that his shots are striking the target.
- (v) If the fixed sight is not in use, the firer will adjust his line of sight on to the target by moving the tangent sight slide, and will inform the instructor of the range required to hit the target.

(b) *Direction* :—

- (i) The instructor gives a range, indicates a target and orders fire.
- (ii) He then indicates the supposed position of the shots right or left of the target.
- (iii) The firer deflects his line of sight to the left or right of the target by the amount the shots fell right or left of it originally.
- (iv) The instructor will check the line of sight. He either informs the firer that the shots are hitting the target, or, if the firer is in error, indicates a fresh point of strike and continues as above until the suitable correction has been made.

(c) *Direction and elevation combined.*

The firer will be required to obtain the correct elevation to hit the target, and to indicate to the instructor a gun aiming mark which will give the necessary deflection right or left of it.

5. Instruction in ranging with ball ammunition.

As efficiency in ranging cannot be attained without practice with ball ammunition, no opportunity should be missed of carrying out this form of training when ball ammunition is being fired.

i. Officers and N.C.Os.

Full instruction must be given during Part III, annual machine-gun course.

Opportunities will also occur during Part IV, annual machine-gun course, and on other occasions.

ii. Other ranks.

- (a) When unit control ceases the firer must be able to range his gun. Therefore an individual observation and registration practice (Practice 11) is included in Part II, annual machine-gun course. It is designed to practise other ranks, when acting as No. 1, to observe the fire of the gun, to correct it on to the target and to register the direction and elevation required to hit the target.

This practice must be considered as an essential part of the machine gunner's training.

- (b) The instructor will assist the 1st-year man by giving an approximate range.

The 2nd-year man must be able to judge the range without assistance.

17. Mounting gun on various types of ground and use of cover

1. This subject will be taught in two stages :—

i. *1st Stage. Taught as individual instruction.*

After the men have passed the tests of elementary drill and are proficient in mounting gun in the lowest position on flat ground, they will be taught to mount the gun on various types of rough ground.

Cover, enemy observation, etc., will not be considered.

ii. *2nd Stage. Taught as training in field duties.*

When the men are proficient in mounting the gun as taught in Stage 1, they will be instructed in those field duties which deal with the mounting of the gun during the occupation of a position.

In this stage, cover and enemy observation are considered.

2. *1st Stage. Mounting gun on various types of uneven ground.*

Stores required—Gun and tripod.

- i. The instructor will explain to the men that the object is to teach them to make a suitable mounting on rough or uneven ground so that the gun will fire accurately.

He will impress on them that when the formation of the ground necessitates the gun being mounted in other than the normal position, the following conditions must be complied with :—

- (a) The position of the rear leg is governed by the shape of the ground, irrespective of the direction in which the gun has to fire.
- (b) The socket must be mounted upright, irrespective of the position of the legs.
- (c) The shoes only, and not the legs, must be bearing on the ground.
- (d) The ground supporting each shoe must be sufficiently firm to ensure that the shoe does not slip during firing.
- (e) The rear leg must be adjusted to give the necessary support according to the fall of the slope.
- ii. The types of ground selected to practise the men in making suitable mountings should include :—
 - (a) The side of a slope for firing in any direction. (See Plate I.)
 - (b) The top of a narrow bank, with object of obtaining maximum command.
 - (c) The side of a bank, in order to clear the top or fire along it. (See Plate II.)
 - (d) A hedgerow, in order to fire through it.
 - (e) A shell hole.
 - (f) Broken ground.

3. 2nd Stage.

Stores required—Gun and tripod, condenser, and three belt-boxes

i. The instructor will explain that the object of this stage is to practise bringing the guns into action and mounting them with minimum exposure to enemy observation and maximum cover from fire.

He will briefly describe the methods by which a section commander may bring his guns into action. (Sec. 32, 3, i.)

ii. He will explain the necessity for good team work between :—

The section corporal * in rear.

Nos. 1, 2 and 3 of each gun detachment.

The section commander and his orderly in front.

iii. He will emphasize the importance of Nos. 1, 2 and 3 of a gun detachment making use of cover, both from view and from fire when :—

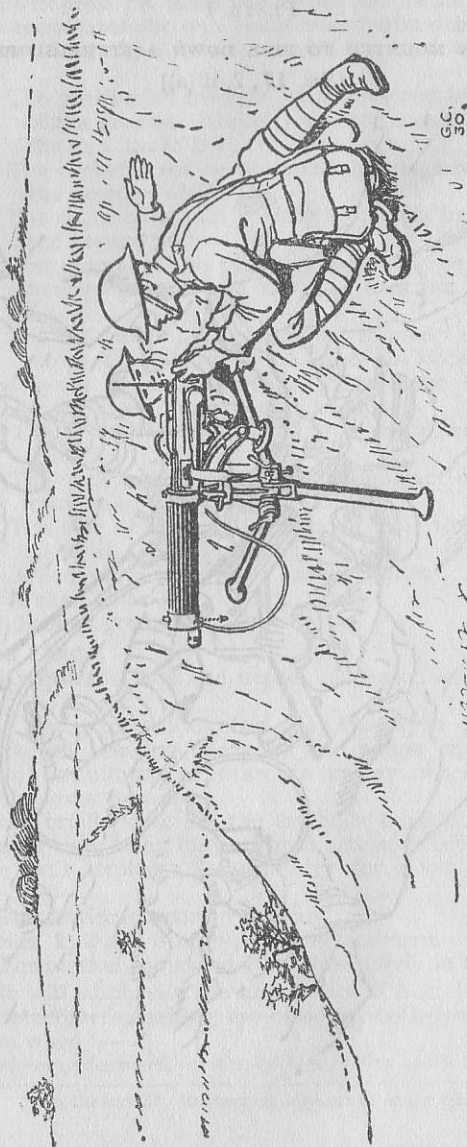
Moving forward on the orders of the section corporal.*

* In the cavalry the second serjeant or senior No. 1.

PLATE I

GUN MOUNTED TO FIRE DOWN A STEEP SLOPE
(Sec. 17, 2, ii (a))





Mounting the gun and placing condenser, ammunition, etc., at the gun.

This will often necessitate crawling and a modified method of carrying the loads.

iv. The instructor will previously decide on—

A target.

One gun position (of a section position) from which to engage it.

Ground from which the enemy can observe.

A point close behind the gun position, to which the section corporal * leads the gun detachment under cover.

He will then assemble Nos. 1, 2 and 3 of the gun detachment with their stores at the point behind the gun position, and the section orderly at the point where the gun is to be mounted.

As soon as the instructor has explained the situation regarding enemy observation, etc., the orderly will signal "Action."

The instructor (acting for the moment as section corporal *) will send forward Nos. 1, 2 and 3 as the situation would demand in this case.

When No. 1, with his tripod, reaches the section orderly, the latter will indicate the exact spot on which the tripod is to be mounted and the nature of the mounting required.

He will, if necessary, assist No. 1 in mounting the gun.

No. 2, when No. 1 is ready, will work forward with the gun, and the mounting will be completed.

No. 3, working forward at the right moment with his load, will place it by the gun and withdraw to his position.

When the gun is in action the positions of Nos. 1 and 2, according to the nature of the mounting and cover available, will be noted.

The instructor will criticize the following :—

Method of getting tripod, gun and ammunition forward to the gun position.

Method adopted by the section orderly and No. 1 in getting the tripod mounted without exposing themselves unnecessarily.

The work of Nos. 2 and 3.

The suitability of the mounting.

The position of Nos. 1 and 2 at the gun.

In regard to the last point above, the nature of the mounting and the cover available will affect their positions. No. 2 must be able to :—

Obey signals from the fire controller.

Attend to the feed.

Assist with immediate action.

* In the cavalry the second sergeant or senior No. 1.

v. Similarly, the instructor will practise the men in the other methods given in Sec. 32, 3, and in mounting the gun behind cover and working forward with it mounted to an exposed position.

He will also practise them in coming into action in the open, in order to carry out the mounting from a lying position.

18. Field signals—Machine guns

1. In addition to the field signals given in Cavalry Training, Vol. I, and Infantry Training, Vol. I, other field signals are required for use in the machine-gun sub-units.

The fire control signals are given as they occur in Part II of this volume.

The field signals, given with the arm, consist of special field signals and semaphore signals.

2. Special field signals.

- i. "Action."—Both arms fully extended, raised from the sides to a position level with the shoulders, and lowered again. The motion is repeated quickly several times.
- ii. "Cease firing."—Arm swung in a circular motion in front of the body.
- iii. "Reconnaissance party forward."—Arm stretched out to the side in line with the shoulder, fist clenched, forearm moved towards the top of the head and back again. The motion is repeated.

3. Semaphore signals.

Code letter B.—More ammunition required.

" " H.—Vehicles or led animals to come up.

" " W.—More water required.

" " A.*—Platoon serjeant

or

Section commanders

or

Section corporals

To join
immediate
superior.

" " AA.—All N.C.Os. to join platoon commander.

4. All ranks must be instructed in the use of the above signals at an early stage in their training.

19. Packing of vehicles

1. Infantry.

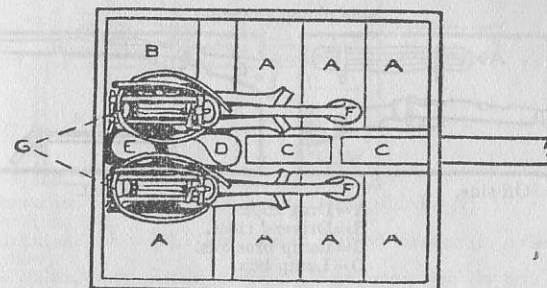
- i. The system of packing limbers is based on the following :—
(a) To avoid galling animals it is essential that the load

* In the cavalry these signals refer to equivalent ranks.

PLATE III

DETAILED METHOD OF PACKING LIMBERS

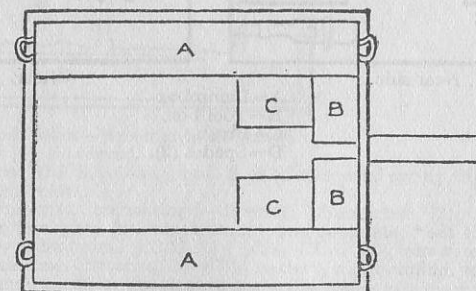
Fig. 1.—Limber—Fore portion—Bottom layer.



- * A = Ammunition boxes—each containing 2 belts (filled)—(7).
- B = Spare parts box.
- C = Cases, cans, oil (2).
- D = Capes, machine-gunners (2).
- E = Gloves, machine-gunners, pairs (2).
- F = Tripods, Mk: IV. (2).
- G = Tubes, condenser (2).

* Corner boxes, large size, must be packed "on edge."

Fig. 2.—Limber—Fore portion—Top layer.

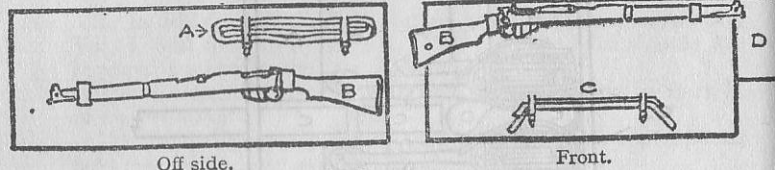


- A = Gun chests (2).
- B = Cans, condenser (2).
- C = Cases, spare parts (2).

PLATE III.—*continued.*

Fig. 3.—Limber—Fore portion.

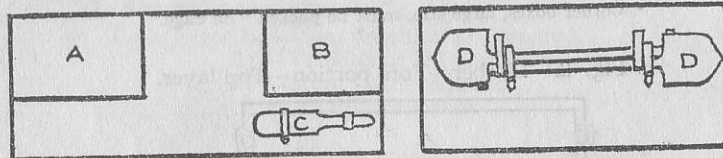
Side panels (outside).



Off side.

Front.

- A=Drag ropes.
B=Drivers' rifles.
C=Lamp brackets.
D=Lamp box.



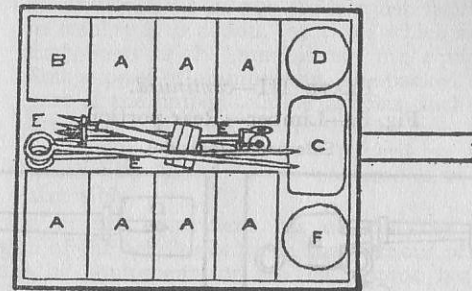
Near side.

Rear.

- A=Lamp box.
B=Tool box.
C=Brush.
D=Spades (2).

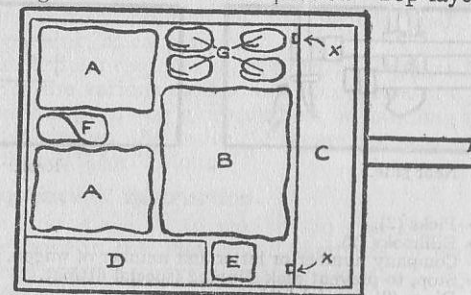
PLATE III.—*continued.*

Fig. 4.—Limber—Rear portion—Bottom layer.



- A=Ammunition boxes—each containing 2 belts (filled)—(7).
B=Night firing box.
C=Ammunition racks (2), Gun hanger, Tripod hanger (in order from below).
D=H.S. Valise, Very pistols, cased (2), Surcingles, web (in order from below).
E=Target posts (2), Mallet, Zero posts (2) (in order from below).
F=Buckets, water (2), containing in order from below:—Nets, hay (4), Brushes (2), Surcingles, leather, padded (2).

Fig. 5.—Limber—Rear portion—Top layer.



- A = Blanket and Valise—(in order from below).
B = Horse rugs (4), if ordered.
C = Case, canvas, B. & S. Case, wood, B. & S. on special spring clips (X) in order from below.
D = Box, instruments, containing:—director, clinometers (2), * field plotter, bar foresights (2), * instrument case complete, * set squares (2), * ebony ruler, pins, J.C.H. (2), pins, J.E.G. (2), screw, clamp, checking, traverse, batteries, torch (2), battery, night aiming, torches, electric, complete (2), bulbs, electric torch (2).
E = Saw (cased). F = old linen. G = spare belts (4).

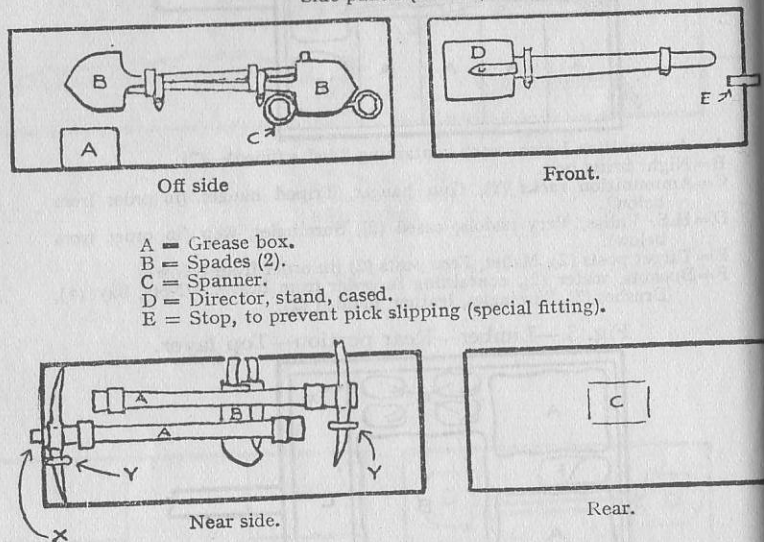
* Only in limber carrying platoon H.Q. stores.

Note.—With large size ammunition boxes, E (Fig. 4) on top of boxes and F buckets, water (Fig. 4) will be packed on top of E (Fig. 5).

PLATE III—continued.

Fig. 6.—Limber—Rear portion.

Side panels (outside).



- A = Grease box.
 B = Spades (2).
 C = Spanner.
 D = Director, stand, cased.
 E = Stop, to prevent pick slipping (special fitting).

- A = Picks (2).
 B = Billhooks (2).
 C = Company number or letter and number of wagon.
 X = Stop, to prevent pick slipping (special fitting).
 Y = Rings (2), special fittings.

in each portion of the limber is well balanced.

The heavier load should be carried in the fore part.

- (b) The arrangement of the loads must facilitate speed in coming into action. Articles which are required first, such as the guns, direct fire equipment and first supply of ammunition, are packed in the fore part of the limber. Other articles, such as indirect fire equipment, are placed in the rear part. The articles in each part are packed so that those which are likely to be required first are most accessible.

ii. A list of the equipment carried and the method of distribution of the articles between the portions of the limber (including the equipment for use of platoon headquarters) will be found in Appendix II.

The detailed method of packing is shown in Plate III.

2. Cavalry.

Vehicles will be packed in accordance with the general principles contained in para. 1, (i), (b), above.

3. Method of instruction.

To attain speed in unloading and loading a vehicle, all ranks must be taught:—

- The correct position in the vehicle, and method of packing, of each article.
- The articles required on the order "Prepare for action" for the various methods of occupation of a position.
- The duties of the gun numbers in handling the various articles on the order "Prepare for action" or "On limber" (or "Mount").

4. Sequence of instruction.

i. The first stage is to explain to the men the various articles carried in the vehicle and their use in general terms. The second stage is instruction in the method of packing the articles and their position.

ii. When the men are proficient in the first two stages, instruction and practice under the headings of paragraph 3, ii and iii, above, should commence, in accordance with the details given in Chapters IV and V.

20. Pack

1. Pack is used as the normal method of carrying guns and equipment by:—

- Machine-gun troops not supplied with mechanical transport.

ii. Machine-gun platoons in countries where the nature of the ground is unsuitable for limbers.

2. In units where the limber is the normal method of carriage, a proportion of pack saddles is available as an alternative method.

3. The system of arranging a pack load is based on the following:—

- i. To avoid galling and sore backs the load must be of suitable weight, steady and well balanced, so that the saddle rides evenly. Adjustment of loads may be necessary, *e.g.* if the barrel casing is not filled.
- ii. The arrangement of the load must facilitate speed in off-loading.

4. **Cavalry.** (See Plates, IX to XV, pp. 93 to 99, and Load Tables, Appendix III.)

In units where machine guns and equipment are carried on pack, each N.C.O. and man of the gun detachment is mounted.

The gun complete with a single belt box is carried on one pack horse, and additional ammunition on a second. In war, there are two ammunition packs to each gun; in peace, one to two guns. The range-finder and indirect fire equipment are carried on the saddles of the riding horses. The night firing equipment, spare parts box, etc., in an ammunition limber.

For details of sets and description of equipment, see Handbook of the 303-inch Vickers Machine Gun, 1930, Chapter XIV.

5. **Infantry.** (See Plates XVI, to XIX, pp. 102 to 105, and Load Tables, Appendix IV.)

i. A pack saddle is carried by each of the off animals of the machine-gun limber team. The remainder of the pack equipment is carried in the rear portion of the limber.

For details of sets and description of equipment, see Handbook of the 303-inch Vickers Machine Gun, 1930, Chapter XIV.

ii. Pack is available for use when conditions become unsuitable for the limber, but is only sufficient for one subsection in each machine-gun section.

The two leaders are used as pack animals. The near leader carries the ammunition pack, and the off leader the gun and tripod pack.

iii. There is no provision for carrying certain parts of the machine-gun equipment, *e.g.* the range-finder, spare parts box, or the indirect fire equipment, and the amount of ammunition carried is limited. The range-taker will carry his instrument in the canvas case. Any additional equipment required must be carried by the gun numbers.

6. Sequence of instruction.

i. The first stage is to explain to the men the details and nomenclature of the pack equipment.

The second stage is instruction in the method of packing the articles and their position on the pack saddles. It is essential that every man should know how to strip the saddles.

ii. When the men are proficient in the first two stages, they will be instructed in the pack drills (Secs. 29 or 30).

The drill for infantry is arranged for loading on pack from the limber and *vice versa*.

21. Range-takers

1. Men selected for training as range-takers should possess the following qualifications:—

- i. Intelligence.
- ii. Second-class certificate of education.
- iii. Good and normal eyesight.

The above qualifications are essential if good results are to be obtained.

Although possessing the qualities referred to above, a man may not become an efficient range-taker. The initial number under training should therefore be in excess of the final requirement.

2. System of training.

i. The system of range-taking instruction may be compared to instruction in firing the rifle. As with the rifle, the first object is to attain a standard of consistency.

With the rifle, the measure of a man's consistency is based on the size of his group of shots; with the range-taker, on his group of coincidences. In range-taking instruction, having dealt with the preliminaries of setting up the instrument, picking up objects and the method of making coincidences, the early training is confined to taking series of readings for consistency. (See Training in the use of the Infantry Range-Finder, 1931, Sec. 3, 4.)

The measure of a man's consistency is his average error. The man should not commence more advanced training until he has attained the required standard of average error as given in Training in the use of the Infantry Range-Finder, 1931, Sec. 5, 28. Having reached this standard, training in adjustment may commence.

ii. The range-finder is a delicate, optical instrument, and individual eyesight varies. Correct adjustment for one man may not suit another. Consequently, each man must learn to adjust his own instrument, so as to be able to read the correct range when a correct coincidence is made.

iii. When a man has become consistent and is able to adjust his instrument, he will be ready for the more advanced training in taking ranges under service conditions, with time limits, and making range cards, etc.

iv. *Progress and accuracy charts.*—In order to keep a record of a man's efficiency in consistency and adjustment of the instrument, charts will be kept in the machine-gun company for each man under instruction in range-taking.

The progress chart is a record of consistency.

The accuracy chart is a record of a man's capabilities in adjusting his instrument.

These charts will be prepared on the lines laid down in Training in the use of the Infantry Range-Finder, 1931, Sec. 6.

The C.O. of the unit should satisfy himself that records of the range-takers' efficiency in consistency are kept up-to-date.

v. The trained range-taker should be efficient in the following subjects:—

- (a) Care of and cleaning his instrument.
- (b) Taking accurate ranges (includes consistency and adjustment, etc.).
- (c) Indication and recognition of targets.
- (d) Making out range cards.
- (e) Use of ground and cover.
- (f) Field and fire control duties.

Headings (a) and (b) above are technical, and the man will be trained in them on the lines laid down in Training in the use of the Infantry Range-Finder.

Headings (c), (d), (e) and (f) are non-technical and tactical. Details of training in these subjects will be found under the appropriate headings of this manual.

Heading (d), Range cards, is dealt with in paragraph 4, below.

3. To maintain a first-class standard of efficiency it is necessary for a man to be kept in constant practice.

4. Range cards. (For details, see Vol. I, 1931, Sec. 48, 9.)

The making out of a range card consists of marking on a card objects to which the range has been accurately obtained by range-finder, or from a 1/20,000 map. From such data intermediate distances can be estimated.

Key ranges are taken accurately to probable targets and recorded on the card.

In selecting objects for key ranges it is preferable that they should be linear and running across the front, e.g. roads, hedges, etc.

5. Range-takers' tests. See Training in the use of the Infantry Range-Finder, 1931, Sec. 11.

CHAPTER IV

DRILL DUTIES AND DRILLS

22. General remarks

1. Sec. 23 contains a summary of the "duties" in gun drill of the platoon serjeant, section N.C.Os. and of each number in the gun detachment. The subsequent sections contain the "drills." The summary is intended as a guide for the instructor, who will use his own words in explaining the duties.

To avoid repetition in the "drills" certain actions of individuals have been written out in full in the "duties." Instruction in these and in the use of the various instruments must be given before the drill in which they occur is commenced.

2. These drills are arranged to meet the average conditions of mobile warfare. Latitude must be exercised in their application. For example, in an extensive programme shoot Nos. 2 may require assistance.

3. **Cavalry.** The drills contained in the following sections are generally appropriate to cavalry. The duties given for the infantry are applicable to the equivalent ranks in the cavalry. Where modifications are necessary, a note has been made to this effect. In the cavalry the duties of the section corporal are divided between the troop serjeant, 2nd serjeant, section leader and senior No. 1, according to circumstances.

23. Drill duties

1. The platoon serjeant.

i. *Direct fire.*

He has no direct fire duties, as the section is the direct fire unit.

ii. *Indirect fire.*

He orders forward the section commanders, points out gun line and the position of the pivot gun (if any). He gives the order "**For indirect fire—mount gun.**"

He is responsible for the general supervision of the duties in the gun position. He acknowledges all verbal orders given by the platoon commander by raising his hand, elbow bent at right angles and upper part of the arm in line with the shoulder, dropping the hand when the order is understood. When an order is signalled by the platoon commander, he will

repeat the signal and give the order out verbally. He will see that the section commanders acknowledge verbal orders from the platoon commander, repeating if required.

If he cannot hear the orders given by the platoon commander, he will send out a connecting link. If the platoon serjeant or the connecting link wish an order or a signal to be repeated by the platoon commander, the following signal may be used:—Arm extended downwards, hand waved across the body parallel to the ground. If necessary, he should employ a section orderly to warn him when the platoon commander is making a signal or to repeat the signal "Stop" when he himself is not in view of the section commanders.

When "Director method" is ordered, he gives the order "**All on director**" as soon as the guns are mounted and the director is in position.

When "Post method" is ordered, he gives the order "**All on No. . . .**" He sees that the pivot gun is laid on the posts, and sets the dial at 180°. He orders No. 1 of the pivot gun to lay on the remaining guns in turn, commencing with the most distant, and reads off and gives out the angles recorded on the dial to the respective guns, commencing with the order "**Zero lines.**"

When "T.O.G. method" is ordered, he will detail the pivot gun as ordered by the platoon commander and will parallel all guns on the line Pivot gun—Director, as in the "Post method." He will then order "**Out zero posts.**"

In "T.O.G. (near observation post)" and "Post" methods, as soon as the guns are on parallel lines, he will report to the platoon commander "*Guns on parallel lines.*"

When the aiming posts are planted he will report "*Guns ready to load*" as soon as all the Nos. 3 have returned to the gun line, except in "T.O.G. (distant observation post)," when he signals to the platoon commander that the guns are ready as soon as he has made all arrangements for opening fire.

At the first opportunity he will take the minimum quadrant angle for clearing the crest by using the second director, or, failing that, by laying a gun and taking a clinometer reading. He will report the minimum quadrant angle to the platoon commander as soon as an opportunity occurs.

He is responsible for seeing that the drill for ascertaining whether guns will clear the crest is correctly carried out. At the time when he reports "*Guns ready to load*" to platoon commander he will also report as to any guns which will not clear the crest.

Where the crest is more than 150 yards distant, he will calculate what range should be placed on the tangent sight to enable the Nos. 1 to check whether the guns will clear (see

Sec. 60, 2, ii (b)) and will order "**Check crest clearance with sight at. . . .**"

If at any time after the guns are in action he is ordered away from the gun line, he will hand over to the senior section commander before leaving.

He signals for the limbers when required.

2. The section commander.

i. Direct fire.

He orders the guns into action and indicates the exact position on which they are to be mounted.

He details an arc of fire and reference points.

He commands his section in action, controls the fire of the guns, and signals for the limber when required.

ii. Indirect fire.

The senior is in command at the position in readiness, and is responsible for ordering the amount of ammunition to be taken up to the gun position and "**For indirect fire—Prepare for action.**"

Each section commander is responsible that the correct stores are taken out of his section limber, and for supervising the duties of the gun numbers at the position in readiness.

When coming into action the section commander doubles forward on the order of the platoon serjeant, and having ascertained the position of the gun line he will place himself on the spot on which the flank gun of his section will be mounted. On the order "**For indirect fire—Mount gun,**" he will supervise the arrival of Nos. 1 of his section, ensuring that his inner gun is the correct distance from him and "staggered" back if the method of indirect fire to be employed demands it.

He commands his section in action and places himself in rear and slightly to the left of his left sub-section, where he can both see and be seen by his Nos. 2 and the fire controller.

He is responsible that all orders to his guns are received and acknowledged by Nos. 2. He will himself also acknowledge all verbal orders affecting his guns by raising his hand, elbow bent at right angles and upper part of the arm in line with the shoulder. He will repeat orders when necessary, and will keep his hand raised if a repetition is required. In the director method he may, as a check, repeat back the angles given out by the fire controller for each gun of the section.

When he sees that both his guns are ready, he will signal to the fire controller by raising his hand as above.

He is responsible that orders are carried out by the gun numbers, and that the various instruments and dials are

correctly adjusted. This does not necessarily entail going to the guns whenever a change in elevation or direction is ordered. A close scrutiny of the manner in which the No. 1 taps the gun or uses the elevating wheel will suffice in most cases to show whether the order is correctly carried out.

Before fire is opened he will check the lines of fire of the guns for parallelism. To do this he will stand behind the guns and glance along each barrel casing in turn. If there is a distant crest in front of the guns, the lines of fire of the two guns should be on approximately the same point. If no distant crest is available, he will see where the line of fire of one gun crosses the crest in front, and make an approximation from this as to where the other should cross right or left of it. He will report immediately to the platoon serjeant should his guns not appear to be parallel.

He sees that when the guns are laid for direction and elevation Nos. 1 check crest clearance. He will notify the platoon serjeant should any gun not clear the crest.

He should not move about the section more than necessary.

Where firing is carried out by chart, he takes charge at one of his guns and interprets into orders the fire control chart for that gun.

If ordered to take charge at the gun position, he will carry out the duties as laid down for the platoon serjeant. He will hand over the section to his section corporal.

He will control the fire of his section when it is acting independently in indirect fire.

iii. *Night firing.*

He locates the gun pegs, points out one of them to the section corporal and indicates the direction of the rear leg. He superintends the mounting of the other gun.

He superintends one of his guns in action in addition to his other duties, assisting Nos. 1 and 2 with his torch as required.

He gives direction to each gun by ordering No. 4 to accompany him with the night firing box to each direction peg in turn. He will hold the lamp over the peg, ordering "No. . . . Direction." When the gun is in the required line, the section corporal reports "No. . . . correct."

He gives out the elevation, and as soon as the guns are in the correct line and the correct elevation has been placed on them, gives the order "Out aiming lamps."

He does not give the order "Load" (or in the case where the platoon commander is controlling, report "Guns ready to load") until both Nos. 3 have reported to him from the front.

3. The section corporal.

i. *Direct fire.*

He is in command of the section at the position in readiness. He orders the amount of ammunition and any extra equipment required to be taken to the gun position, gives the order "Prepare for action" and supervises the numbers going into action.

ii. *Indirect fire.*

He assists the section commander at "For indirect fire, prepare for action."

When firing is carried out by chart, he takes charge at one of the guns of his section and interprets into orders the fire control chart for that gun.

He will be prepared to carry out the duties of section commander when required.

When his section is acting independently in indirect fire he will perform the indirect fire duties laid down for the platoon serjeant and the section commander.

iii. *Night firing.*

He gives the order "For night firing—Prepare for action."

He reports to the section commander on the position, and is pointed out his gun peg and direction of rear leg.

He supervises the mounting of one gun over its peg.

At the order "No. . . . direction" he goes to the gun named and reports "No. . . . correct" as soon as he is satisfied that the gun is accurately laid for direction.

He superintends in action the gun told off to him by the section commander and assists No. 1 and No. 2 in their duties with his torch when required.

Paras. 4, 5 and 6 below refer to cavalry only.

4. The troop serjeant.

As for the platoon serjeant with the following additions:—

i. *Indirect fire.*

When firing is carried out by chart, in action, he takes charge of one gun of the right section, and interprets into orders the fire control chart for that gun.

He signals for the vehicles when required.

ii. *Night firing.*

He gives the order "For night firing—Prepare for action." "Dismount."

In action he takes charge of one gun of the right section, assisting Nos. 1 and 2 with his torch as required.

5. The second serjeant.

i. *Direct, indirect and night firing.*

He will take charge at either one or both section positions

in readiness. After the guns are in position he will perform the duties behind the gun line as laid down for section corporals (paragraph 3, above).

When firing is carried out by chart, he takes charge of one of the guns of the left section, and interprets into orders the fire control chart for that gun.

ii. *Night firing.*

In action he takes charge of one of the guns of the left section, assisting Nos. 1 and 2 with his torch as required.

6. **The section leader.**

As for the section commander, with the following additions:—

i. *Direct, indirect and night firing.*

He gives the orders "**Prepare for action**" and "**Dis-mount.**"

ii. *Night firing.*

The duties of both the section commander and section corporal (see paragraphs 3, iii, and 4, iii, above) are divided between the section leader and the troop serjeant, or 2nd serjeant.

7. **Gun numbers.**—Although the following duties have been subdivided under the heads of "Direct fire," "Indirect fire" and "Night firing," certain of the indirect fire duties will require to be taught at the same time as "*Section drill*—*Direct fire*," so as to cover the cases where, when firing direct, circumstances render it necessary for indirect means to be employed to enable the aim to be maintained and fire continued.

8. **No. 1.**

i. *Direct fire.*

* He commands the gun in action, and is responsible that it is clean and that the mechanism is working smoothly.

* He carries the tripod in and out of action, removing it from and replacing it in the limber as ordered. He mounts and dismounts the gun as directed, assisted by No. 2.

* He is at all times responsible that his clamp is correctly adjusted.

* He loads, lays and fires the gun in accordance with the orders of the fire controller.

He will call "Repeat" at the conclusion of the "Indication" should it not be clear.

He does not commence to lay his gun until told to do so by No. 2. When the gun is laid he informs No. 2.

* See note on page 55.

* He will frequently check his aim between bursts of fire.

* When the order "Stop" is given he relays on to his original point of aim.

* He maintains the gun in action in accordance with the instructions contained in the handbook of the gun.

He will observe his own fire, but he will not correct on his own observation, except in the case of control breaking down.

When ordered by the fire controller, or on his own initiative if he notices that his point of aim is becoming obscured, he will pick up a gun aiming mark. To do this he will check his aim, and without moving the gun, run his tangent sight slide up or down until his line of sight passes through a mark as prominent and distant as possible. He memorizes the reading on the tangent sight. Whenever possible he will relay on his original point of aim, adjusting his sights for range in accordance with the fire orders he has received.

ii. *Indirect fire.*

NOTE.—The following duties are additional to the normal duties at the gun, marked * under "*Direct fire*" above.

He directs No. 3 when planting the aiming posts or aiming lamps. In indirect fire he will relay on the bull for direction on all occasions when No. 2 places deflection on the bar foresight.

When ordered to lay on the director, he will lay on the socket just above the reading plate. When laying on another gun he will lay on the centre of the socket.

At all times when an order necessitating the use of the clinometer is given, he lowers the tangent sight and raises the rear cover. He takes correct holding while the elevation is being placed on the gun. When No. 2 has removed the clinometer he closes the rear cover and raises the tangent sight.

In indirect fire, as soon as the elevation has been placed on the gun, if no order as to crest clearance has been received, he will drop the slide of the tangent sight to 400 yards and ascertain whether the line of sight clears the crest, reporting to the section commander should it not do so.

iii. *Night firing.*

Once the order to fire has been given, he will stop firing when the lamps are turned out.

Cavalry.—In addition to his other duties, the senior No. 1 moves the section forward from the position in readiness if the 2nd serjeant is not present.

9. **No. 2.**

i. *Direct fire.*

* He acts as assistant to No. 1.

* See note on this page.

* He carries the gun in and out of action, removing it from and replacing it in the limber with the assistance of No. 3. He assists No. 1 to mount and dismount the gun.

* He will assist No. 1 in the adjustment of the traversing clamp.

* He carries the spare parts case in action.

* He is responsible for observing all signals and conveying their meaning to No. 1.

* When the order to fire or stop is given, he will tap No. 1 on the back, saying "Fire" or "Stop" as the case may be.

When a direct fire order is given, he orders No. 1 to lay as soon as the fire controller raises his hand.

* When told to do so by No. 1, and when his gun is ready to fire, he will raise his hand, dropping it when an allowance for wind or the order to fire is given. The left hand will be extended behind No. 1's back, straight from the shoulder and at such a height that it can be seen by the fire controller.

He will also raise his hand as above on the cautionary order preceding the range or any correction in elevation.

He will drop his hand on completion of the order, to indicate that it has been understood.

He will not drop his hand should he wish the order repeated.

When No. 1 picks up a gun aiming mark, No. 2 will ascertain its position and the setting on the tangent sight. He sets the dial at zero.

ii. *Indirect fire.*

NOTE.—The following duties are additional to the normal duties at the gun, marked * under "*Direct fire*" above.

If indirect fire is ordered, he carries the bar foresight and clinometer in action. They should be set at zero when not in use. In indirect fire he kneels on the right of the gun in such a position that he can both see his section commander and attend to the service of the gun.

He will raise his hand with the elbow bent at right angles and the upper part of the arm in line with the shoulder, on the cautionary order preceding any order affecting his gun.

He will drop his hand on completion of the order, to show it has been understood.

He will not drop his hand should he wish the order repeated.

After the order "**Zero lines**" has been given, he keeps the dial at zero until a fresh zero line is ordered.

He places elevation on the gun by means of the clinometer. He sets the clinometer at the angle ordered, and as soon as No. 1 has raised the rear cover, places it with the arrow to the front on the side plates of the breech casing of the gun.

* See note on page 55.

When it is required to ascertain the quadrant elevation on the gun, he places the clinometer on the side plates, turns the milled head until the bubble is central, and takes the reading.

10. No. 3.

i. *Direct fire.*

He is responsible for keeping No. 2 supplied with all his needs for maintaining the gun in action.

He assists No. 2 at the limber. He carries the condenser and the initial supply of ammunition into action, and carries the condenser out of action.

He is responsible for effecting minor repairs as required by No. 2.

ii. *Indirect fire.*

In addition to the above, he plants aiming posts as ordered, under the direction of No. 1.

He plants zero posts when required.

iii. *Night firing.*

When the aiming lamp is attached to the aiming post he plants it in the normal way, except that he will be unable to get direction from looking over the sights.

11. No. 4.

i. *Direct fire.*

He is responsible for anticipating and meeting the demands of No. 3 for ammunition, spare parts, oil, water, and any other articles of equipment.

ii. *Indirect fire.*

No additional duties.

iii. *Night firing.*

He is responsible for the night firing box, and carries it in and out of action when required. After handing the lamps to No. 3 he pays out the wire and attends to switching the lights on and off, or dimming them as ordered.

12. No. 5.

In action he assists No. 4 at the limber. He acts as brakesman when necessary.

NOTE.—Since Nos. 5 are not included in peace establishments (home), Nos. 4 will perform the duties of Nos. 5 in addition to their own.

24. *Elementary gun drill*

1. The object of elementary gun drill is to render the man proficient in the duties of gun numbers in handling the weapon. It aims at teaching each man:—

- i. To mount and dismount the gun.
- ii. To load and unload the gun.
- iii. To bring the gun into action.
- iv. To cease firing.
- v. To adjust the sights and to lay the gun.
- vi. To fire the gun, to stop firing and to go on firing.
- vii. To traverse, the oblique traverse, and the swinging traverse.
- viii. To execute an order correcting the elevation on his gun, both in direct and in indirect fire.
- ix. To perform any of the above (except controlled corrections indirect fire) in or from the lowest position.

2. Method of carrying out the drill.

i. The *stores* required vary according to the portion of the drill which is being carried out. But for all the drill each squad requires a gun, tripod, spare parts case complete, condenser and tube, and belt box with belt and dummy cartridges. When additional stores are required, details are given in the instructional notes. The condenser tube used will consist of a piece of $1\frac{1}{2}$ -inch rope, 6 feet long, attached by a union joint to the gun.

ii. *Safety precautions.*—At the beginning of each parade when dummy cartridges are used, the instructor will inspect them to ensure that there are no live rounds amongst them. He will also inspect the D.P. locks to see that the points of the strikers are filed. This refers also to the drills laid down in Secs. 26, 27 and 28.

iii. *Laying out the stores.*—Before the squad falls in, the gun and tripod will be placed in line on the ground, 3 yards apart, tripod on the left with the legs to the rear; the muzzle of the gun pointing to the front, the condenser tube attached, and the spare parts case close to and on the right of the gun. The belt box and condenser will be placed centrally together, with the condenser on the right, 3 yards in rear of the gun and tripod.

NOTE.—The meaning of the term "Arc of fire" will first be explained, and then a simple arc detailed. If necessary, a landscape target may be used for this purpose.

iv. The squad is fallen in, in single rank. The instructor details any three men. He falls them in with the right-hand man 8 yards in rear of the gun and numbers them off. The remainder of the squad under instruction is placed in such a position that the maximum benefit is derived although they themselves are not at the moment acting as No. 1, 2 or 3.

If at any time the instructor wishes to change round Nos. 1,

2 and 3, he should order "Fall out 1." No. 1 becomes No. 3, No. 2 becomes No. 1, and No. 3 becomes No. 2, the detachment renumbering at once, the instructor detailing three fresh numbers to take their place when he wishes to do so.

v. The instructor must see that the standard of drill is maintained throughout, that the numbers remain still and correctly placed on the completion of any necessary movement, particularly in the sitting or lying position.

When the instructor wishes to explain, criticize, or demonstrate, he will, if the detachment is standing, always first order "*Stand easy*," and if the detachment is sitting or lying "*Rest*," to allow of relaxation of the muscles. Before the drill is resumed he will ensure that the numbers adopt the correct position, alert and ready for any order. If the detachment is sitting or lying, this will be effected by the order "*Position*."

vi. The orders given by the instructor are given in inverted commas at the head of each paragraph. All orders will be given verbally.

3. "Take post."

The detachment will turn right with the exception of No. 1. No. 1 doubles forward and lies down on the left of the tripod. He inspects the tripod to see that the elevating and crosshead joint pins are properly in position and turned down, both elevating screws equally exposed, traversing clamp sufficiently tight to prevent the crosshead from swinging round when the tripod is being carried, the crosshead over the rear leg, direction dial secure, rear leg correctly adjusted and all three legs together and clamped securely.

When No. 2 has reported to him, he reports "*All correct*" (or otherwise) to the instructor.

No. 2 doubles forward, lies down on the right of the gun and slings the spare parts case over his right shoulder. He inspects the case to see if the contents are complete, and inspects the gun to see that the "T" fixing pin is screwed home and vertical, the tangent sight set at 600, the lock in the gun, the sliding shutter closed, the feed block in the gun, the front cover locked, the muzzle attachment correctly adjusted and the condenser tube fitted.

When No. 3 has reported to him, he reports "*Gun and ammunition correct*" (or otherwise) to No. 1.

No. 3 doubles forward and lies down on the left of the belt box. He inspects the belt box to see that the rounds are in the front of the belt, and pointing the right way. He closes and fastens the box. He inspects the condenser to see that the cap is screwed in position and that the filler is secure.

He reports "*Ammunition and condenser correct*" (or otherwise) to No. 2.

The duties of Nos. 1, 2 and 3 will be taught separately, each man being practised individually before the detachment is drilled collectively. After each man has learnt his duties, it will only be necessary to check the contents of the spare parts case twice, i.e. by the first No. 2 and the last No. 2. When the ground is too wet the detachment should be instructed to stand up instead of lying down, but waterproof sheets should be used to avoid this when possible.

4. "Mount gun."

No. 1 jumps to his feet, picks up the tripod and doubles forward with it, placing it on the ground with the socket on the spot indicated. Standing astride the legs, he loosens both jamming handles simultaneously, grasps the crosshead bracket as far forward as possible with both hands, and, with a forward and upward movement, erects the tripod (Plate IV). Supporting the tripod with the left hand at the crosshead bracket, the left forearm resting on the thigh, he ensures that the rear leg is on the ground and the socket upright over the spot indicated, and tightens up both jamming handles with the right hand if possible. After putting a final pressure with each hand on the jamming handles, he sits down behind the tripod, removing the elevating and crosshead joint pins.

As soon as No. 2 places the gun on the tripod, No. 1 hands No. 2 the crosshead joint pin, and grips the left traversing handle with the left hand. When No. 2 has inserted the crosshead joint pin, No. 1 will insert the elevating joint pin and turn the handle down. He levels his gun by means of the elevating wheel, tests by tapping the traversing handles to see if the adjustment of the traversing clamp is approximately correct, and sits, looking straight in front of him, with his elbows supported by the inside of his thighs, his third and little fingers round the traversing handles, forefingers on top, second finger underneath the safety catch, and thumbs resting lightly on the thumbpiece.

No. 2 opens the sliding shutter, and, picking up the gun with his left hand grasping the right traversing handle and his right arm over the barrel casing, doubles forward to the right side of the tripod, arriving about the time No. 1 is removing the pins. He sinks on to the left knee, places the gun on the tripod, supporting the barrel casing with his right thigh, and with his right hand drives in the crosshead joint pin which No. 1 has handed to him, finally turning the handle down (Plate V). He retains his hold with his left hand on the right traversing handle until the pin is home. He lies

PLATE IV
ERECTING THE TRIPOD

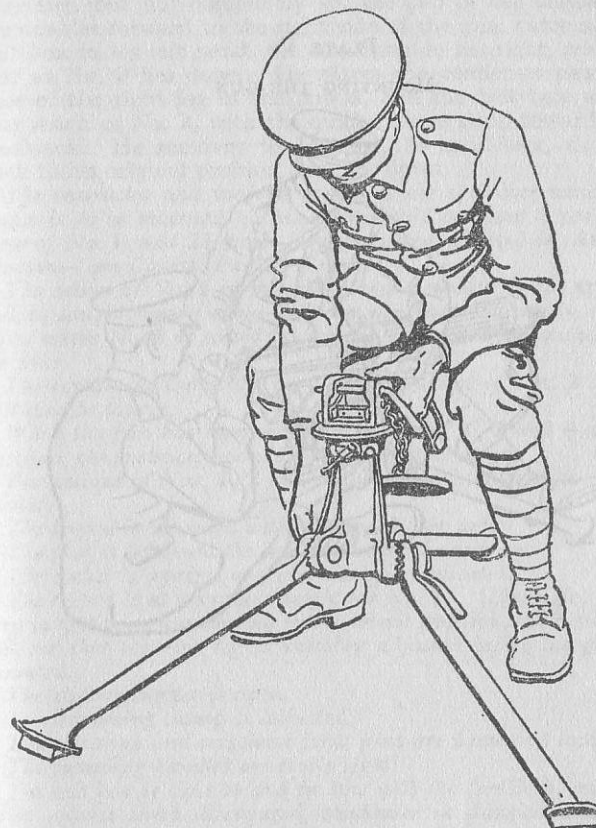


PLATE V
MOUNTING THE GUN



down on the right of the gun looking towards the gun, his head in line with, but below, the level of the feedblock. When No. 3 has brought up the belt box and condenser, No. 2 places the former in line with the feedblock, and inserts the condenser tube into the latter.

No. 3 disengages the quick release strap of the belt box and unscrews, but not completely so, the cap of the condenser. He doubles forward to the right side of the gun, carrying the belt box in his left hand, the condenser in his right, arriving just as No. 2 lies down. He places the condenser near the shoe of the right leg of the tripod, and the belt box within easy reach of No. 2, with the quick release strap towards the feedblock. He removes the cap of the condenser, doubles back to his original position, and lies down.

The instructor will indicate to No. 1 the spot over which the socket is to be mounted. This spot should be about 5 yards in front of No. 1, and 25 yards from the target as used in *Annual Machine-Gun Course, Part I*, if in use.

The action of No. 1 in mounting and dismounting the tripod will be taught first, ending and commencing respectively at the point where No. 1 is seated behind the tripod and has withdrawn the pins.

The remaining duties of No. 1 and the duties of Nos. 2 and 3 will then be taught.

When the gun has been mounted and Nos. 1, 2 and 3 are in position, the instructor should remark whether:—

The actions of Nos. 1, 2 and 3, and their final positions, were correct.

The tripod is mounted with reference to the arc.

The gun is level and the crosshead over the rear leg.

The socket is upright and over the spot indicated.

The tripod is at a suitable height for No. 1. (Until No. 1 has been taught to mount the gun in the lowest position, the instructor will see that the rear leg is suitably adjusted before the gun is mounted.)

The sliding shutter is open.

The traversing clamp is adjusted.

The elevating and crosshead joint pins are home and locked.

The jamming handles are really tight.

The belt box is close to and in line with the feedblock, with the quick release strap disengaged, condenser in position and tube inserted in it.

5. "Dismount gun."

No. 1 removes both pins, steadies the gun with his right hand, and, after No. 2 has removed the gun, replaces the pins and turns the handles down. He jumps to his feet, stands

astride the tripod and loosens both jamming handles simultaneously, allowing the tripod to collapse on the ground. Grasping the crosshead bracket with both hands and giving the tripod a sharp upward and forward movement, he folds up the legs and places the tripod on the ground. He clamps up both jamming handles simultaneously and lies down on the left of the tripod with the right hand gripping the crosshead. He reconditions the tripod if necessary as in "Take Post."

No. 2 pushes the belt box away to the right, jumps to his feet, and, after No. 1 has removed the pins, lifts the gun off the tripod. He moves to the right clear of No. 1, closes the sliding shutter, and places the gun on the ground. He lies down on the right side of the gun, reconditioning it if necessary as in "Take Post."

No. 3 doubles forward, seizes the belt box in his left hand and the condenser in his right, and places them on the ground 3 yards in rear. He lies down on the left of the belt box and condenser, reconditioning them as in "Take Post."

The instructor will order "Replace stores" when he wishes the stores to be returned to their position as originally laid out.

6. "Load."

No. 1 pulls the crank handle on to the roller with the right hand, and advances his left hand to the left of the feedblock, ready to grip the belt. When No. 2 has passed the tag of the belt through the feedblock, No. 1 grips it and pulls the belt through the feedblock as far as possible. He must pull the belt slightly to his left front when doing so. He releases the crank handle, taking care not to allow his right hand to move forward with it. He again pulls the crank handle on the roller, pulls the belt and releases the crank handle. Whilst pulling the crank handle on to the roller the belt will be held, but not pulled, with the left hand.

No. 2 opens the belt box, seizes the end of the belt with the right hand at the point where the tag joins the fabric, forefinger along the tag, and pushes the tag through the feedblock as far as possible. He must ensure that the belt is not twisted on entering the feedblock.

The instructor should explain that the pulling of the belt slightly to the left front is only to avoid the natural tendency to pull it to the rear, i.e. towards No. 1, and that the belt must not be pulled too much to the left front or with too much force. If belts having no brass strips are used for this drill, the belt must be pulled gently and straight.

Should any man exhibit a tendency to slur the loading motions, it may be advisable to make him load "by numbers," counting aloud whilst doing so.

7. "Unload."

No. 1 knocks down the tangent sight with his left hand. At the same time, without touching the belt, he pulls the crank handle on to the roller twice in succession with the right hand, allowing it to fly forward again in each case. He presses the top and bottom pawls of the feedblock with his right hand, the top pawls with the fingers and the bottom with the thumb, taking care to keep his hand clear of the entrance to the feedblock. When the belt is being withdrawn, and the last round is clear of the feedblock, he will press the thumbpiece.

No. 2 withdraws the belt from the feedblock when No. 1 presses the pawls, steadying the belt with his left hand near the belt box, and his right near the feedblock. He packs the belt correctly in the box and closes the lid.

The instructor will order No. 1 to raise the tangent sight (if it is not already raised) before ordering "Unload."

8. "Action."

Nos. 1, 2 and 3 perform the duties learnt in "Mount Gun" and "Load," the gun being loaded as soon as it is correctly mounted with reference to the arc (Plate VI).

9. "Cease firing."

Nos. 1, 2 and 3 perform the duties learnt in "Unload" and "Dismount gun," the gun being dismounted as soon as it has been unloaded correctly.

10. "Clear gun."

No. 1 pulls the crank handle on to the roller, raises the rear cover, removes the lock from the lock guides, and eases the crank handle forward, allowing the lock to rest against the hinge of the rear cover. He reports "Gun clear."

If it is desired to replace the lock in the gun and close the rear cover, but not to load the gun, the command "Lock in—Cover down" may be used. If the gun is loaded, "Clear gun" will be preceded by "Unload."

11. "Stand clear."

Nos. 1 and 2 jump to their feet and stand at ease one pace in rear of the gun, No. 2 on the right.

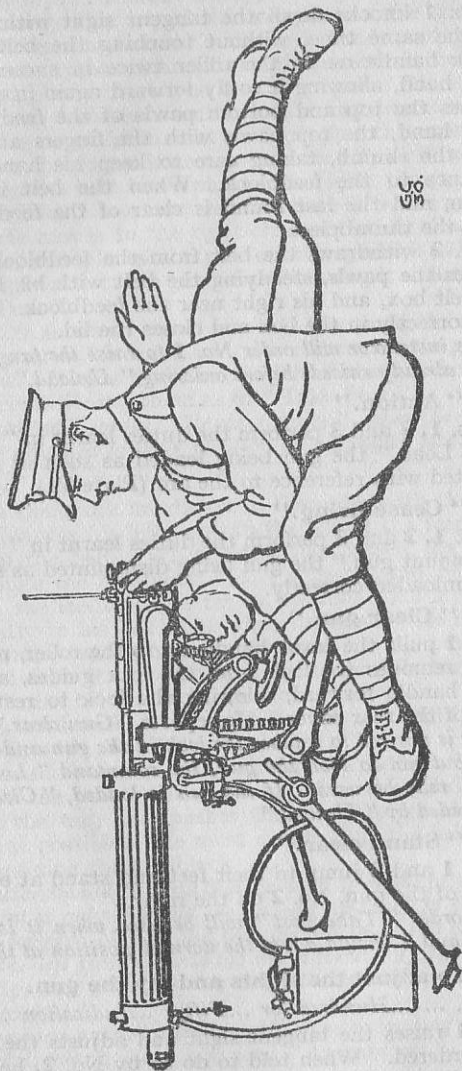
The order "Take post" will be used when it is desired that Nos. 1 and 2 should adopt the normal position at the gun.

12. To adjust the sights and lay the gun.

"No. ... Hundred (or ... Fifty) ... Indication ... Lay."

No. 1 raises the tangent sight and adjusts the slide to the range ordered. When told to do so by No. 2, he commences to lay the gun by tapping the gun until the correct direction

PLATE VI
NORMAL FIRING POSITION—SITTING



is obtained, and elevating or depressing until the aim is correct. He orders No. 2 to loosen the traversing clamp when a large change in direction is necessary, and to tighten the clamp again when the gun is roughly aligned on the target. He retests his clamp.

When tapping the gun, or turning the wheel, No. 1 maintains control of the gun by keeping the disengaged hand on the traversing handle. When the gun is laid, No. 1 instructs No. 2 to raise his hand, at the same time raising the safety catch with his second fingers.

No. 2 acknowledges receipt of the range, repeats to No. 1 the instructor's order to lay, attends to the clamp, and finally raises his hand when told to do so by No. 1, to indicate to the instructor that the gun is laid.

Before the lesson is commenced, instruction in aiming must have been given; also in the acknowledgment by No. 2 of the receipt of the range, and his signal to indicate that the gun is laid (cf. duties of No. 2).

Ranges under 600 should not be ordered. The gun will be numbered either No. 1 or No. 2 for the lesson. The targets indicated within the arc of fire should be very simple, the object being not to teach recognition, but clean and accurate handling by No. 1.

The instructor should order "lay" when he wants No. 1 to do so.

If no natural aiming points are available, a landscape target may be used, being placed at any convenient distance from the gun.

13. "Fire."

No. 2 taps No. 1 lightly on the back and repeats "Fire."

No. 1 instantly presses in the thumbpiece as far as possible by a quick and even movement of the thumbs, keeping his eyes directly on the target. He will fire in bursts, keeping the thumbpiece pressed for two or three seconds before releasing and pressing again, occasionally checking his aim between bursts.

14. "Stop."

No. 2 taps No. 1 lightly on the back and repeats "Stop."

No. 1 immediately releases pressure on the thumbpiece and safety-catch. He checks his aim, relaying on to the original point of aim if necessary.

The instructor should occasionally turn the wheel while No. 1 is firing, in order to ensure correct relaying when "Stop" is ordered.

15. "Go on."

Nos. 1 and 2 resume action as detailed under "Fire."

16. "To traverse."

"No.Hundred (or ...Fifty) ...Indication ...Traversing."

When No. 2 tells him to lay, No. 1 lays on left end of the target indicated. When ordered to fire by No. 2, No. 1 fires a burst as before and releases pressure on the thumbpiece.

He strikes the right traversing handle a firm but glancing blow with the bottom part of his right palm, deflecting the gun through an angle of 15 minutes to the right. He fires another burst, taps as before, and will continue to do so, firing a burst between each tap, until No. 2 tells him to stop,* or until the right end of the target indicated is reached, when he continues as before, but taps with his left hand on the left traversing handle.

For drill in traversing, the oblique traverse, and the swinging traverse, the gun will be mounted 25 yards from the target as used in the *Annual Machine-Gun Course, Part 1*, and the fact that the bull's-eyes are four inches apart must be pointed out to the men (4 inches subtends 15 mins. at 25 yards).

The instructor will explain that the object of the exercise is to develop a consistent automatic tap, and to ascertain the degree of tightness required in the traversing clamp, in order that the line of sight may be displaced fifteen minutes each time the gun is tapped.

The following points will be explained :—

- i. A strong tap with a tight clamp is preferable to a weak tap with a loose clamp.
- ii. When tapping with either hand, the gun must be held correctly with the other hand, and the safety catch kept raised.
- iii. During initial instruction eyes must be directed at the target the whole time, and not at the rear end of the gun or along the sights.
- iv. If the gun moves too much or too little, the traversing clamp must be altered, not the tap.

The instructor will show how to test the adjustment of the traversing clamp.

Whenever the gun is mounted or if a new No. 1 takes post at the gun he tests the adjustment. The instructor should point out the importance of this, and also the importance of the correct "feel," as later no row of bulls will be available.

He will also exercise No. 1 in traversing to the left, ordering "from right to left traversing."

The tangent sight will be raised during the exercise.

The gun will be numbered either No. 1 or No. 2 for this lesson.

* During initial instruction the gun is not relaid.

17. The oblique traverse.

"No.Hundred (or ...Fifty) ...Indication... Traversing."

No. 1 proceeds as before, except that after each tap, before firing again, he relays his gun on to the target immediately above or below the point to which his tap has carried it.

The instructor will explain that the object of the exercise is to train No. 1 in combining traversing with relaying on to an oblique target.

The following points will be explained :—

- i. The correct sequence of action must be followed, i.e. fire, tap, elevate (or depress).
- ii. The tapping must be automatic, as in ordinary traversing.
- iii. When elevating or depressing the gun, the sights must be used.

The gun will be numbered either No. 1 or No. 2 for this lesson.

18. The swinging traverse.

"No.Hundred (or Fifty) ...Indication ...Swinging traverse."

No. 1 lays as before, on the left end of the target, at the same time directing No. 2 as to the adjustment of the traversing clamp. When ordered to fire by No. 2 he swings the gun slowly to the right, maintaining pressure on the thumbpiece throughout. He moves the gun, not by a movement of the forearms alone, but by keeping the upper part of the body fairly rigid and forcing it over to the left.

The instructor will explain that this method of traversing is only employed against linear targets at very close ranges, when the normal method of traversing is likely to prove too slow.

The following points will be explained :—

- i. The traversing clamp must not be so loose that No. 1 loses control of the gun, the vibration of the gun rendering it easy to swing.
- ii. The rate of movement should be such that the line of sight is moved about 1 yard in 2 seconds, when the target is 25 yards from the gun. The movement of the gun is almost imperceptible.
- iii. The thumbpiece should be pressed at the same time as the gun begins to move.

The importance of the crosshead being upright must be emphasized. No. 1 will be exercised in traversing to the left as well as to the right.

The gun will be numbered either No. 1 or No. 2 for this lesson.

19. Controlled corrections.

- i. To execute an order correcting the elevation when firing direct.

"Stop ...All ...Up (or down) ...Go on."

No. 2 acknowledges the receipt of the correction in elevation.

No. 1 adjusts his sights in accordance with the order, relays on his original point of aim by turning the handwheel, and continues firing.

The object is to teach No. 1 to relay the gun after altering the sights in obedience to a correction in elevation.

ii. *To execute an order correcting the elevation when firing indirect.*

"Stop ...All ...Up (or down) ...Go on."

No. 2 acknowledges the receipt of the correction in elevation.

No. 1, using the graduations on the elevating wheel, elevates or depresses the gun through the angle ordered. He readjusts his line of sight on to the bull by moving his tangent sight slide up or down.

The object is to teach No. 1 to readjust the line of sight on to the aiming post after turning the handwheel in obedience to a correction in elevation.

The gun will be mounted, the bar foresight affixed, and an aiming post planted about 10 yards in front of it. The sights will be set at 2,500 yards, and the instructor will lay the gun on to the bull. The gun will be loaded and fire opened before the exercise commences.

Before this lesson No. 1 must have received instruction in the use of the graduations on the elevating handwheel and aiming over the bar foresight. He should have an elementary knowledge of the function of the aiming post. No. 2 must have received instruction in his position at the gun in indirect fire and the acknowledgment of orders in that position. Clinometer not introduced.

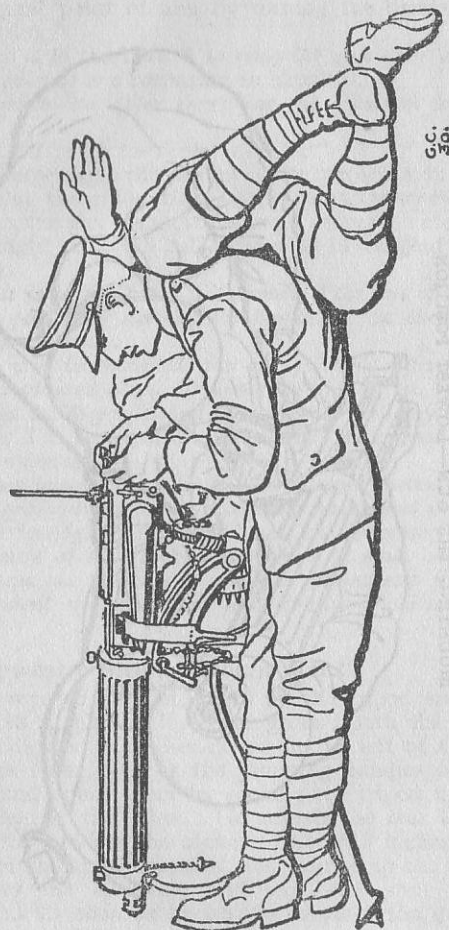
20. "Lowest position—Mount gun."

No. 1 jumps to his feet, picks up the tripod and doubles forward with it, placing it on the ground with the socket on the spot indicated. He lies down on the left of the tripod, head to the front, loosens the jamming handles of the two front legs and opens them by rocking the tripod first to one side and then to the other. He adjusts the rear leg for the lowest position, raises the socket to about 3 inches from the ground over the spot indicated, and clamps up the front legs. He removes the elevating and crosshead joint pins. He assists No. 2 as soon as he arrives to place the gun on the tripod, drives in the crosshead joint pin and turns the handle down, supporting the barrel casing as necessary with his left hand (Plate VII). He swings round, keeping all parts of his body below the gun and lies with his legs to the front, right leg crossed over the left on the left of the tripod, his back and

PLATE VII
MOUNTING THE GUN—LOWEST POSITION



PLATE VIII
LOWEST POSITION—FIRING POSITION



neck being supported by No. 2. He levels his gun by means of the elevating wheel, tests by tapping the traversing handles to see if the adjustment of the traversing clamp is approximately correct, and finally holds the gun, keeping his elbows well into the body and resting if possible (Plate VIII).

No. 2 opens the sliding shutter, and picking up the gun, doubles forward with it to the right side of the tripod, arriving as No. 1 is about to withdraw the pins. Placing the right arm under instead of over the barrel casing, he lies down beside the tripod.

Assisted by No. 1 he places the gun on the tripod. As soon as No. 1 has inserted the crosshead joint pin, No. 2 inserts the elevating joint pin, retaining his hold with his left hand on the right traversing handle until the pin is home.

He places correctly the belt box which No. 3 has brought up to him, and inserts the condenser tube into the condenser. Finally he lies on his right side, supporting No. 1 in the back with his right thigh and at the neck with his left knee.

No. 3 acts as directed in "Mount gun."

There are two methods of obtaining the correct adjustment of the legs of the tripod in order that the gun may be mounted in the lowest position:—

- i. Before the order "Mount gun" is given, No. 1 is told to set the rear leg at an angle suitable for the lowest position. In addition, the two front legs are swung forward and upward and clamped in that position instead of being folded alongside the rear leg.
- ii. The tripod is carried forward by No. 1 with the legs folded in the usual way, i.e. with the rear leg set at an angle suitable for the sitting position, the rear leg being adjusted by No. 1 at the time when he is actually erecting the tripod.

The drill detailed is for this last method, and must be varied slightly when (i) is employed.

In (i), when No. 1 lies down beside the tripod, it will not be necessary for him to loosen the jamming handle of the rear leg. In addition, the front legs will be swung downwards to the ground, instead of being opened from the normal folded position. The instructor should teach the mounting of the gun by both methods in the above order, first teaching how to set the rear leg at an angle suitable for the lowest position, and how to return it to the angle suitable for the normal sitting position to suit the convenience of the firer.

The notes under "Mount gun" apply here also, the instructor in addition seeing that the tripod is really mounted in the lowest position and that the jamming handles of the rear leg do not interfere with the elevating wheel.

Each lesson in elementary drill (except controlled corrections indirect fire) should be practised in or from this position, but not before a certain proficiency has been reached in each case with the gun normally mounted.

21. "Dismount gun" (from the lowest position).

No. 1 removes both pins, and after No. 2 has removed the gun, replaces them and turns the handles down. He swings round, keeping all parts of his body below the crosshead, until his head is to the front. He loosens the jamming handles of the front legs, allowing the tripod to collapse on to the ground. By rocking the tripod first to one side and then to the other he folds up the legs and clamps up the jamming handles. He reconditions his tripod if necessary as in "Take post," but without altering the rear leg.

No. 2 acts as detailed in "Dismount gun," except that he remains lying down throughout, rolling over with the gun above him, on to his left side when he wishes to get clear of No. 1.

No. 3 acts as in "Dismount gun."

After ordering "Replace stores" the instructor will direct No. 1 to reset the rear leg for the normal position.

25. Tests of elementary gun drill

1. The following tests have been devised to assist officers in testing the efficiency of their men in elementary gun drill, and to ensure that no detail of the drill is overlooked. It is important that these tests should not be considered solely as competitions against time, for although quickness is necessary, accuracy is the first essential. No man should, therefore, be passed as efficient unless all the points are correctly carried out, even though he may complete them in the standard time. Whilst passing the test for accuracy, men who slightly exceed the standard time should be tested again before being put back for further instruction.

The nature of tests vii, ix and x renders it inadvisable to lay down a standard time.

2. The tests must be carried out in strict accordance with the detailed instructions given, for unless the smallest details are insisted upon, the time limit will not be applicable. In carrying out these tests, time can be saved if the first pair complete tests i to v consecutively; the remainder can be carried out as convenient.

3. Other ranks, except full rank N.C.Os., will qualify annually in tests i to xiii. They will act both as No. 1 and No. 2. Full ranks will qualify in their first year in the machine-gun company.

The No. 1 should not be failed when, owing to the fault of No. 2, the time limit is exceeded. He must be tested again with a fresh No. 2.

4. No man will fire his Annual Machine-gun Course until he has correctly passed these tests of elementary gun drill. A record will be kept by each platoon commander and produced for inspection by the company commander as required.

5. The tests are as follows :—

i. To erect the tripod and mount the gun on the command "Mount gun."

Nos. 1, 2 and 3 will take post, lying down if the ground permits. The position where the gun is to be mounted to be not more than 5 yards away.

Points to be observed.—All the points given in Sec. 24, 4.

Standard time : 20 seconds.

ii. To load the gun on the command "Load."

Belt with a few dummy rounds at the end, properly packed in the box, which will be closed.

Points to be observed.—The gun to be correctly loaded; all loading motions to be quite distinct and correct, and to be carried out without any slurring.

Standard time : 5 seconds.

iii. To unload the gun on the command "Unload."

Points to be observed.—Gun unloaded, tangent sight lowered, unloading motions to be distinct, belt withdrawn and repacked carefully in the box with lid closed; lock spring released.

Standard time : 5 seconds.

iv. To dismount the gun on the command "Dismount gun."

The gun will be dismounted on the spot.

Points to be observed.—All the points as when "All correct" is reported before mounting gun.

Standard time : 15 seconds.

v. To bring the gun into action on the command "Action."

This test combines i and ii. It should not be applied until proficiency has been attained in each of those tests.

Points to be observed.—All points as laid down for tests i and ii. When No. 1 is ready to receive fire orders, No. 2 will hold up his hand.

Standard time : 25 seconds. The time will be taken from the command "Action" until No. 2 raises his hand, indicating that the gun is loaded.

vi. **To adjust the sights and lay the gun on the command " (Range)—(Target)."**

Gun loaded and ready to be laid. Three service targets will first be pointed out, but the No. 1 being tested will not be informed of the order in which they are to be given out. A different range will be ordered for each target.

Points to be observed.—That the slide is adjusted and the gun laid with absolute accuracy.

Standard time : 12 seconds for each target.

The time will be taken from the range being ordered until No. 2 holds up his hand, indicating that No. 1 is ready to open fire.

All three targets to be engaged, and all to be correct.

vii. **Horizontal traversing. On the command " Fire," e.g. " 450—Horizontal row—From left bull's-eye—To right bull's-eye—Traversing—Fire."**

The target will be as for the annual machine-gun course, Part I, placed at 25 yards from the gun. The gun will be laid on any bull's-eye that may be ordered. The tangent sight will be raised, but the firer must keep his eyes directed at the target during the traverse. The tests will comprise traversing from RIGHT to LEFT, as well as from LEFT to RIGHT. When the gun is laid, the aim should be checked by the officer conducting the test. On the command " Fire," No. 1 will fire a group at the bull's-eye named, then traverse, so that the next group will be fired at the next bull's-eye and so on. The test will not be completed until the space between nine bull's-eyes has been traversed. In order to ensure that the traversing is satisfactory throughout, the order to stop will be given at least once during the traverse, but not before five groups have been fired. The laying will be checked after each order to stop and when the limit of the traverse is reached.

Points to be observed.—That No. 1 tested his clamp before beginning the test; the object is to test if No. 1 has acquired the correct automatic tap. Tapping backwards to correct errors will not be allowed. By counting the number of taps, the correct point of aim can be calculated. At no check should the point of aim be more than one space out.

viii. **Controlled corrections.**

Three tests will be carried out. In each test the firer must pass within the standard given.

(a) *Direct fire.*

Gun loaded and laid on target.

Order to fire is given.

Order " Stop. All (or No. . . .), Up (or Down)

. . . Go on."

Corrections exceeding 300 yards up or down will not be given.

Standard time : 6 seconds.

Points to be observed.—Sights correctly adjusted and gun relaid.

Time will be taken from correction being ordered till No. 1 presses thumbpiece to continue firing.

(b) *Indirect fire.*

Gun loaded and laid on aiming post.

Elevation checked by clinometer.

Order to fire is given.

Order " Stop. All (or No. . . .), Up (or Down)

. . . mins. Go on."

Corrections exceeding 45 minutes up or down will not be given.

Standard time : 6 seconds.

Points to be observed.—Correct alteration in elevation to be put on by wheel, within two minutes either way. Slide correctly adjusted.

Time will be taken as in (a) above.

ix. **Oblique traversing. On the command " Fire," e.g. " 450—Oblique row—Left bull's-eye—To right bull's-eye—Traversing—Fire."**

The target will be as for the Annual Machine-Gun Course, Part I, placed at 25 yards from the gun.

The procedure will be as for vii, but in this test manipulation of the elevating wheel is included and the firer is allowed to look along his sights. The tests will comprise traversing from RIGHT to LEFT, as well as from LEFT to RIGHT.

Points to be observed.—As in test vii.

x. **Immediate action.**

In this test the man will be required to rectify correctly each of four different stoppages within a reasonable time. The officer superintending the test must ensure that the immediate action is correctly performed without any unnecessary delay.

A target should be indicated to the whole detachment previous to the test. The crank handle should be covered with a cloth to conceal its position. On the removal of the cloth for covering the crank handle, the No. 1 will perform the immediate action.

NOTE.—Tests xi, xii and xiii, below, will be carried out by all 2nd-year machine-gunners. 1st-year machine-gunners will carry out these tests without time limits.

xi. Bar foresight.**(a) Affixing the bar foresight.**

Gun mounted, man to be tested will kneel on right side of gun, carrying the bar foresight, with sliding foresight set at zero, in its case.

On the command "Prepare for indirect fire" the man to be tested will affix the bar foresight to the gun.

Standard time : 8 seconds.

N.B.—This should also be carried out in the dark, and the same standard should be reached.

(b) Setting the foresight.

The man to be tested will kneel by the barrel of the gun, hands to be clear of the bar foresight, which will be clamped on the gun with the foresight clamped at zero. The number of degrees and tens of minutes deflection R. or L. will be named.

Standard time : 6 seconds. For the test four deflections will be given. All should be correct.

xii. Clinometer.

Clinometer in its case and set at zero, rear cover open and gun approximately level. An order for elevation or depression of not more than 4° will be given. The order will always include minutes given in multiples of 5.

The man to be tested will adjust clinometer and lay the gun. No holding will be taken.

Clinometer will be left on the gun.

Standard time : 20 seconds.

xiii. Use of dials.

Gun mounted, laid on a zero post with direction dial at zero, and clamped. On the command "All Right (or Left). . . degrees . . . minutes" (switch will not be less than 40°), the man to be tested will unclamp the gun, adjust the pointer and clamp.

Standard correct within 20 minutes.

Time : 5 seconds."

NOTE.—The following test will be carried out annually by the N.C.Os. of the platoon :—

xiv. Director.

Instrument on the director stand with the telescope screwed fully home, elevation and scales at zero, director sight set at zero but not clamped.

A clearly defined mark will be pointed out to the N.C.O. to be tested, within an arc of 45° on either side of the zero line.

On the order to commence, the N.C.O. will lay on the target

and read out the angles of deflection from zero, and of elevation or depression.

Standard.—Three tests to be carried out. To pass, the reading must be within 10 minutes of deflection and 5 minutes of elevation or depression.

Time : 25 seconds.

26. Section drill—Direct fire**1. To prepare for action (Infantry).**

The section corporal—"Prepare for action."

Nos. 1, 2, 3 and 4 of each sub-section double to the fore part of the limber. Odd sub-section on the off side, even sub-section on the near side. No. 4 in front, then Nos. 3, 2, 1 in that order. Each unfastens a rope and the cover is thrown back on to the perch.

No. 1 removes the tripod and condenser tube from the limber, doubles forward 25 yards and 10 yards to the flank, places them on the ground and lies down on the left side of the tripod.

No. 2, assisted by No. 3, removes gun chest and places it on the ground beside the limber.

No. 2 removes gun from chest.

No. 3 removes spare parts case and drops strap over No. 2's right shoulder.

No. 2 doubles forward and places the gun on the ground 3 paces to the right of No. 1, and lies down on the right side of the gun.

After No. 2 has taken up his position No. 1 hands over the condenser tube to him.

No. 2 fixes the condenser tube to the gun.

Meanwhile No. 3 takes out one belt box and the condenser, doubles to a spot 3 paces in rear and immediately between Nos. 1 and 2, and lies down on the left side of the ammunition box and condenser.

No. 4 takes out four belt boxes, places two on the ground beside the limber, and doubles forward to No. 3 with the other two, placing them with the box already there. Doubles back to the limber, picks up the two boxes he left there, and doubles to a position about 10 yards to the flank of the limber and lies down.

If the section corporal orders more than five boxes to go up to the gun position No. 4 takes forward the two he has now with him. No. 5 removes the extra boxes from the limber and takes them up to No. 4. The number of journeys made will depend on the number of extra boxes required and the length of the carry.

Nos. 5 rearrange the remaining stores in the limber, replace gun chests and limber covers, and fall in in the rear of the limber.

The gun numbers will examine their stores as in "Elementary gun drill," reporting correct or otherwise to the section corporal.

The section corporal lies down midway between the sub-sections and five yards in front.

2. To prepare for action (Cavalry).

Section leader—"Prepare for action."

"Ammunition normal" (or the number of (belts) boxes).

The sub-section prepare to unload stores as under :—

No. 1—the tripod.

No. 2—the gun with condenser tube fixed.

No. 3—one belt box and condenser.

No. 4—four belt boxes (or up to the number ordered).

The range-taker—the range-finder.

The vehicle halts when ordered by the officer or N.C.O. in charge of it.

The section leader dismounts, moves forward and indicates the position in readiness.

The driver brings the vehicle forward to this position and halts.

3. To dismount for action (Cavalry).

Section leader—"Dismount."

Range-taker dismounts and moves forward to join section leader.

Nos. 1, 2, 3 and 4 of each sub-section dismount in that order. Sub-sections moving forward on their respective sides of the vehicle to a point about 25 yards in front of it and 5 yards to a flank, where they take up their positions.

The Nos. 4 remove ammunition from the vehicle up to the total number of belt boxes required and take two forward to the position of their Nos. 3.

They return for the remaining boxes.

The senior No. 1 is responsible for informing the driver when all personnel and equipment required are clear of the vehicle.

The driver moves the vehicle to the rear.

The subsequent action of the Nos. 4 will depend on the orders given by the section leader.

4. To come into action.

Section commander—"Action."

Nos. 1, 2 and 3 mount the gun on the spot indicated by the section commander in accordance with the detail for "Action" in Elementary gun drill, Nos. 3 taking up condenser and 2 belt boxes, Nos. 4 taking up the remaining boxes to No. 3.

NOTE.—As soon as the limber is unloaded the section corporal sends it to the rear. He places the higher numbers in position.

5. To engage a target.

Fire orders will be executed in accordance with instructions on fire control and fire discipline. (Sec. 70.)

When a satisfactory standard has been reached the section should be exercised with the fire controller on the right of or between the guns. (See Sec. 68, 6, ii (b).)

The practice of fire orders in all forms is an essential part of this drill.

6. To continue firing in the event of the target becoming obscured.

i. When target is likely to be obscured for a short time only—

Section commander—"Pick up gun aiming marks."

No. 1 picks up a gun aiming mark.

No. 2 sets the direction dial at zero. He looks over the sights and memorizes the aiming mark, its position and the setting of the tangent slide.

ii. When target is likely to be obscured for some time—

Section commander orders gun aiming marks to be picked up as above.

He then orders "Indirect fire equipment."

No. 3 passes order back to No. 4.

Nos. 4 or 5 remove clinometers and aiming posts from limber, hand them to No. 4 of the odd sub-section who takes them up to Nos. 3. No. 3 hands clinometer to No. 2.

At first opportunity the section commander orders "check elevation."

No. 1 relays on gun aiming mark.

No. 2 sees that direction dial is set at zero, and takes the elevation on the gun with the clinometer.

Section commander—"Unload." "Clear guns."

No. 1 unloads and clears gun as in Elementary gun drill.

Section commander—"Out aiming posts."

No. 1 closes rear cover.

No. 3 plants aiming post under the direction of No. 1.

7. To make preparations in daylight to continue firing in darkness.

NOTE.—Section commander sends for section corporal and any night firing stores which is not already at the gun position.

Section commander—"Prepare for night firing."

No. 1 relays on target (or aiming post if firing indirect).

No. 2 sets dial at zero and takes the elevation on the gun with the clinometer. He attaches the bar foresight if not already on.

No. 4 of the odd sub-section brings up the night firing box and two torches, and hands one each to the section commander and the section corporal.

He places the night firing box between the sub-sections and lies down in rear of it, having first extracted the night sights and handed them to Nos. 2.

No. 2 fixes the night sights and the section corporal reports to section commander "No. . . . Ready."

Section commander—"Unload." "Clear guns."
"Out aiming lamps."

No. 4 of the odd sub-section hands night aiming lamps to Nos. 3, who will move out in front of the guns taking with them aiming posts if not already planted. They plant night aiming lamps under the direction of No. 1 and return by the flanks, reporting to the section commander when in.

Section commander orders "Load" and "Fire" as required.

8. The replacement of breakages.

i. Where the spare part required is carried in spare parts case—

No. 2 replaces broken part from spare parts case. He then hands the broken part to No. 3 with the wallet.

No. 3 repairs the part and returns it with the wallet to No. 2, if possible waiting until the next supply of ammunition is required.

No. 3 informs No. 4 which item from the wallet has been used. No. 4 or 5 obtains it from the spare parts box, passes it up through No. 3 to No. 2, who replaces it in the wallet as soon as he is able.

ii. Where spare part required is not carried in the spare parts case—

No. 2 informs No. 3 what is required. No. 3 informs No. 4. No. 4 or 5 obtains it from the limber and passes it up through No. 3 to No. 2.

9. To cease firing (Infantry).

Section commander—"Cease firing."*

Nos. 1, 2 and 3 cease firing as in Elementary gun drill. No. 3 takes back the aiming post if forward, and makes as many journeys as necessary to remove the belt boxes at the gun.

When signalled for, the limber, under orders of the section corporal, moves forward to a position immediately in rear of the gun position accompanied by Nos. 4 and Nos. 5 and halts.

Nos. 4 and Nos. 5 remove cover from fore part of the limber, throw it back on to the perch, take out gun chests and lay them on the ground. They square off the belt boxes which are left in the limber.

No. 4 doubles forward and lies down 10 paces in rear of No. 3.

Section commander—"On limber."

No. 3 doubles back to the limber with the condenser, aiming post if forward, and as many belt boxes as possible.

No. 4 doubles forward, takes up belt boxes not brought back by No. 3 and doubles to the limber.

Nos. 3 and 4, assisted by No. 5, pack the floor portion. If the night firing box has been in use, No. 4 of the odd sub-section returns it to the limber on his first journey.

No. 1 doubles back with the tripod, No. 2 with the gun, clinometer and bar foresight if forward. As soon as the floor portion is packed No. 1 replaces tripod in limber.

No. 2 takes off the condenser tube and hands it to No. 1, who replaces it in the limber.

No. 2 places the gun in the chest, closes and secures the lid.

Nos. 2 and 3 lift the gun chest into position.

No. 2 replaces spare parts case in limber.

If aiming post, bar foresight and clinometer have been forward, No. 5 takes these over from Nos. 3 and 2 and repacks them in the rear portion, doing up the cover.

Nos. 2 and Nos. 3 replace cover on front portion.

As soon as each number has completed his duties he will double to his original position.

10. To cease firing (Cavalry).

Section leader—"Cease firing."

Nos. 1, 2 and 3 cease firing as in Elementary gun drill.

No. 3 takes back the aiming post if forward, and makes as many journeys as necessary to remove the belt boxes at the gun.

* If the aiming posts are planted, section commander first orders "Unload." "Clear Guns."

The section leader signals for the vehicle, and indicates the position to which it is to come.

The driver brings the vehicle up to this spot. (If no position is indicated by the section leader the driver will bring the vehicle to the spot where the section dismounted.)

11. To mount (Cavalry).

Section leader—"Mount."

All personnel mount the vehicle in the reverse order to that in which they dismounted, placing their equipment on the vehicle as best they can, stowing it away at the first opportunity, after every one has mounted.

The section leader is responsible that all guns, equipment, etc., are placed on the vehicle, and will inform the driver when the vehicle is ready to move.

27. Platoon drill—Indirect fire

1. To prepare for action.

Senior section commander—"For indirect fire—Prepare for action."

The action of each section will be as in Section drill—Direct fire. In addition the section corporals and Nos. 5 unfasten the cover on the rear portion of the limber.

The former take out clinometers and bars foresight, and hand the same to their Nos. 2. No. 2 places the sling over the left shoulder. Nos. 5 take out aiming and zero posts and hand the same to their Nos. 3. The section corporals assist Nos. 5 to square off kit, etc. The section commanders will place themselves midway between their sub-sections and five yards in front, and lie down.

Cavalry.

As for Section drill—Direct fire, except that Nos. 2 remove the clinometer and bar foresight and Nos. 3 the aiming post in addition to their other loads.

2. To come into action.

Platoon serjeant—"Section commanders."

Section commanders double forward, receive their orders from the platoon serjeant, double back to the flanks of the gun line and kneel.

Platoon serjeant—"For indirect fire—Mount gun."

No. 1 doubles forward, mounts his tripod on the position indicated by the section commander. He stamps in the shoes of his tripod before sitting down.

No. 2, having mounted the gun, kneels on his left knee on the right side of the gun, and affixes the bar foresight.

Nos. 3 and 4 carry out their duties as in Section drill—Direct fire.

NOTE.—A section corporal will march the Nos. 4 and 5 and the limbers to the rear.

3. To parallel the guns.

The guns are paralleled by one of the methods described in Chapter IV.

i. Director method.

Platoon serjeant—"All—on director."

No. 1 lays on the director, and when laid No. 2 sets the dial at zero.

Platoon commander—"Zero lines."

"No. . . . Right (or left) . . . deg. . . . mins."

"No. . . . ditto."

"No. . . . ditto."

"No. . . . ditto."

After each angle is given out it will be repeated back by the section commander concerned.

No. 2 swings the gun through the angle ordered and resets the dial at zero.

ii. Post method.

Pivot gun.—At "Mount gun" No. 1 aligns his gun on the posts with the assistance of No. 2, moving the tripod right or left until his line of sight is in exact alignment of the posts. When this has been checked by the platoon serjeant the latter sets dial at 180°.

Platoon serjeant—"All—On No. . . ."

Nos. 1 of remaining guns lay on the pivot gun. When laid, Nos. 2 set their dials at zero.

No. 1 of the pivot gun lays on each gun in turn as directed by the platoon serjeant.

Platoon serjeant—"Zero lines."

"No. . . . Right (or left) . . . deg. . . . mins."

"No. . . . ditto."

"No. . . . ditto."

Nos. 2 swing their guns through the angle ordered and reset the dials at zero.

No. 2 of the pivot gun finally swings his gun back to 180° and sets the dial at zero.

iii. T.O.G. method.

Pivot gun.—As for ii, "Post method," except that the gun is laid on the director.

The guns are then paralleled as in ii, "Post method."

Platoon serjeant—"Out zero posts."

No. 3 plants the zero post, directed by No. 1.

4. To place the necessary elevation on the gun.

Platoon commander—"Elevation (or Depression) No. . . . (or all) . . . deg. . . . mins."

No. 2 sets clinometer at elevation (or depression) ordered, and assisted by No. 1 places the elevation (or depression) required on the gun.

He replaces the clinometer in its case without resetting it at zero.

5. To check crest clearance.

i. *Near crest.*

When the gun has been laid for elevation Nos. 1 set tangent sight slide at 400 yards, and see that the line of sight over the gun foresight clears the crest. If it does not clear he reports to the section commander. "*No.... does not clear crest.*"

ii. *Distant crest.*

Platoon serjeant—"Check crest clearance with sights at. . . ."

No. 1 sets tangent sight at graduation ordered and proceeds as in i.

6. To plant aiming posts.

Platoon commander—"Out aiming posts."

No. 3 plants aiming posts under the direction of No. 1.

After aiming posts have been planted, No. 1 tests the adjustment of his clamp, finally relaying on to the bull.

7. To load.

Platoon commander—"Load."

No. 1 loads in normal manner.

8. To distribute (or Concentrate).

Platoon commander—"Distribution (or Concentration)."

"No. . . . Nil."

"No. . . . Right (or left) . . . deg. . . . mins."

"No. ditto."

"No. ditto."

No. 2 sets the bar foresight at the angle ordered.

No. 1 taps the gun across until his line of sight is on the aiming post.

If distribution is ordered, Nos. 1 and 2 check elevation as follows:—

No. 1 raises the rear cover.

No. 2 places the clinometer on the outside plates and levels the bubble by turning the handwheel.

No. 1 adjusts his tangent sight slide so that the line of sight is on the aiming post and notes the reading.

9. To traverse.

Platoon commander—"Traversing right and left . . . Taps."

Nos. 1 of the right section in action traverse first to the left, Nos. 1 of the left section first to the right, by the amount ordered.

10. To make an allowance for side wind.

Platoon commander—"Wind right (or left) . . . deg. . . . mins."

No. 2 sets the bar foresight at the amount ordered. (If the bar foresight is not at zero he adds or subtracts this amount to or from the angle on the bar foresight.)

No. 1 taps the gun over until the line of sight is on the aiming post.

11. To engage a target.

The target is engaged by means of fire orders in accordance with the instructions on "Fire control" and "Fire discipline" laid down. (Sec. 71.)

12. To change the elevation.

Platoon commander—"Stop—All up (or down) . . . mins." "Go on."

No. 1 relays on aiming post, makes the necessary correction with the elevating wheel, adjusts his line of sight and continues firing. If the elevation is lowered, he first checks crest clearance.

No. 2 adds or subtracts the angle ordered to or from the setting on the clinometer.

13. To change target.

i. *Direction.*

Platoon commander—"All . . . On zero lines."

No. 2 sets the bar foresight at zero.

No. 1 relays on aiming post.

No. 2 sees that the dial is at zero.

Platoon commander—"All—Right (or left) . . . deg. . . . mins."

(a) Where the angle ordered can be put on bar foresight—

No. 2 sets bar foresight at angle ordered.

No. 1 relays on aiming post.

(b) Where the angle ordered cannot be put on bar foresight—

No. 2 swings the gun through the angle ordered by means of the direction dial.

ii. *Elevation.*

Platoon commander—"Elevation (or Depression)—No. . . . (or all) . . . deg. . . . mins."

Elevation or depression is placed on the gun as before.

(a) Where the angle of switch ordered can be put on bar foresight—

No. 1 readjusts his line of sight on to his aiming post.

He ascertains whether his gun will clear the crest and the aiming post.

(b) When the angle of switch ordered cannot be put on the bar foresight—

Platoon commander—"Unload." "Clear guns." "Out aiming posts." "Load," etc.

or platoon commander orders, No. 1 to pick up a gun aiming mark, and then continues with the fire order.

14. *To come out of action.*

Platoon commander—"Unload," "Clear guns," "Cease firing," "On limber."

The movement will be carried out as in Section drill—Direct fire.

No. 3 will take back zero post if in use.

NOTE.—No. 2 removes bar foresight before the gun has been dismounted.

28. *Section drill—Night firing*

NOTES.—1. The following drill presupposes that guns are being brought up after dark.

2. *Cavalry.*—The duties of the section commander and section corporal are carried out as under:—

In the right section. By the troop serjeant and section leader.

In the left section. By the second serjeant and section leader.

1. *To prepare for action.*

Section corporal—"For night firing—Prepare for action."

All duties are the same as for indirect fire—Prepare for action, except that gun numbers will remain with their equipment close to the limber and that No. 4 of the odd-numbered sub-section removes the night firing box.

No. 5 of the odd sub-section, in addition to his other duties, carries out the ammunition duties of No. 4.

2. *To come into action.*

Section commander or section corporal—"No. . . . For night firing—Mount gun."

No. 1 moves forward with his tripod to a position pointed out to him by the section commander or section corporal a few feet in rear of the gun peg. He removes the crosshead, and with the assistance of the section commander or section corporal mounts the tripod so that the cross-wires are directly above the peg. He stamps in the shoes, and after the section commander or section corporal has satisfied himself that the mounting is directly above the gun peg, No. 1 replaces the crosshead.

He calls up No. 2.

No. 2 mounts gun on tripod, fixes the bar foresight and the night firing sights when the latter are handed to him by No. 4.

No. 3 brings forward aiming post, condenser and two ammunition boxes. He places the condenser and ammunition beside the gun in the normal manner and proceeds to the centre of the section with the aiming post.

No. 4 of the odd sub-section brings forward the night firing box, places it between the two guns, hands the night firing sights to No. 2, and lies down in rear of the box. He accompanies the section commander to the direction pegs when ordered to do so.

3. *To lay the gun in the required line.*

Section commander—"No. . . . Direction."

No. 1 of the gun named aligns gun on lamp.

No. 2 sets the dial at zero.

The section corporal checks the line of each gun in turn, reporting "No. . . . correct" as soon as he has finished.

4. *To give elevation to the gun.*

Section commander—"Elevation (or Depression) . . . deg. . . . mins."

Nos. 1 and 2 place elevation on the gun (assisted by supervising N.C.O.).

No. 1 sets sight at 2,500.

5. *To plant aiming lamps.*

Section commander—"Out aiming lamps."

No. 4 unfolds the handle, opens the box and hands the lamp to No. 3, who places it on the aiming post. No. 3 holds the aiming post in one hand and the cable in the other.

No. 4 unwinds the cable and No. 3 moves on to the line of direction of the gun.

No. 4 switches on the light, and No. 1 directs No. 3, verbally, as to the planting of the aiming lamp, as when planting the aiming post.

After the lamp has been planted No. 3 moves in round flank and reports to section commander when in.

NOTE.—The remainder of the drill in action is as for "Indirect fire."

6. To change from night firing to direct fire.

Section commander—"Prepare for direct fire."
 "Unload"—"Clear guns."
 "In aiming lamps."

No. 3 picks up the aiming post, holding the cable as in para. 5, above. If the lights are on, No. 4 switches them off.

As No. 3 moves in, No. 4 winds in the cable. He should hold the body of the box between his knees, turn the handle with his right hand, and with his left hand lead the two cables regularly across the drum. Regularity in winding is essential.

No. 3 removes the lamp from the aiming post, hands it to No. 4, who replaces it in the box, closes the box and restores the folding handle to its slot.

Nos. 1 remove night backsights and hand them to Nos. 2.

Nos. 2 remove night foresights and bars foresight.

No. 4 of the odd sub-section collects the night sights from Nos. 2 and the torches from the section commander and section corporal, and replaces them in the limber or in a place of safety.

7. To cease firing during darkness.

Section commander—"Unload"—"Clear guns."
 "In aiming lamps."

Nos. 1, 2, 3 and 4 carry out their duties as in paragraph 6, above.

Section commander—"Cease firing"—"On limber."

This drill will be carried out as in Section drill—Direct fire.

29. Pack saddle drill—Cavalry

(See Sec. 20, Plates IX to XV (pp. 93 to 99), and Appendix III.)

1. General instructions.

Pack leaders will have saddled up pack horses with pack saddle, breast collar, breeching, crupper, nosebags, and shoe case in the normal way. The gun pack leader will also attach to the gun pack:—

Near side—the gun hanger.

Centre—spare barrel.

Off side—one tripod hanger, one ammunition box and sling.

He will ensure that the girths pass through the ammunition box sling, and that the latter is put on after the tripod hanger. This will prevent the tripod hanger slacking off when the led horses are being taken back.

Nos. 1 and 2 will lay out the gun, condenser, condenser tube and tripod as for dismounted drill.

Nos. 3 and 4 will load the ammunition racks as laid down in load tables.

No. 3 will be responsible for the cases, can, oil.

When a second ammunition pack is available, the numbers detailed to load it will attach the pick and helve after saddling up.

2. Loading packs from ground.

Section leader—"Load pack."

No. 1 picks up the tripod with his right hand under the dial; his left hand should grasp the rear leg just above the shoe. He then doubles forward and places it in the tripod hanger on the off side of the pack, just resting on the ammunition box. Holding up the tripod with the right hand he secures the "D's." Care must be taken that the front suspending strap passes above the right knuckle and underneath the left knuckle of the tripod socket, the base of the socket lying flat on the saddle. If this is not done the load will not "ride." Then, using both hands, he will tighten up the detachable strap of the tripod hanger in the triangular buckle.

No. 2 takes up the gun in the normal manner, doubles forward and places the gun on the gun rests. He then puts on the "D's," tilting up the gun at the same time by placing the left hand on the pivot of the crosshead and raising it upwards and outwards. Next he buckles up the "V" sling attachment, taking care that neither the triangular buckle or the straps catch in either the feed block or vulcanite filling plug.

No. 3 first takes up and puts on the cases, can, oil, passing the securing strap through and behind the arches of the first ammunition pack saddle; then doubles back and fetches up the off side ammunition rack and load.

He attaches this to the pack by slipping the rings on the back of the rack on to the hooks of the pack saddle.

No. 4 puts on the condenser in its leather carrier, with the condenser tube rolled and strapped on the upper side, between the rack on the near side and the arches of the saddle, then doubles forward with the near side ammunition rack and load. He places it in the manner described above on the hooks of the pack saddle, and passes the steadying strap through the runners of the girth and hands it up to No. 3.

No. 3 tightens up the steadying strap, making sure that it is passed through the runners of the girth.

On completion of the above duties the numbers double back and fall in in their original positions.

Where a second ammunition pack is available, it is loaded in a similar manner to the above, disregarding the cases, can, oil.

3. Action from pack (dismounted).

Section leader—"Action."

No. 1 doubles to the tripod (off side), releases the detachable strap of the tripod hanger (quick release strap), grips the tripod at the socket with the right hand, while with the left he unhooks first the rear and then front running "D's" on the suspending straps from the hooks on the arch of the pack saddle, dropping the whole of the "V" sling attachment clear of the tripod, removes tripod, doubles forward (carrying it in the most convenient manner) and erects it on the spot indicated.

No. 2 doubles to the gun, releases the gun rest strap (quick release), allowing the gun to sink into the gun rest, grips the right traversing handle with the left hand, while with the right he unhooks the "D's," unhooking the rear one first (it is frequently necessary to raise the gun slightly with the left hand when unhooking the front "D") and dropping the slings clear. Retaining the grip of the right traversing handle, he will seize the barrel casing just in front of crosshead, lift the gun clear of the gun rests and remove it from the pack. He then turns to his right, and with the gun under the right arm doubles forward to where the tripod is erected.

He will also take into action the condenser tube; he will be responsible for attaching it to the gun and to the condenser, which will be passed up to him by No. 4 through No. 3.

No. 3 doubles to the off side of the first ammunition horse, releases the quick release and removes the two outside belt boxes, doubles forward to a suitable position, ready to supply the gun immediately it is mounted. He will act as the channel of supply for water, breakages and repairs.

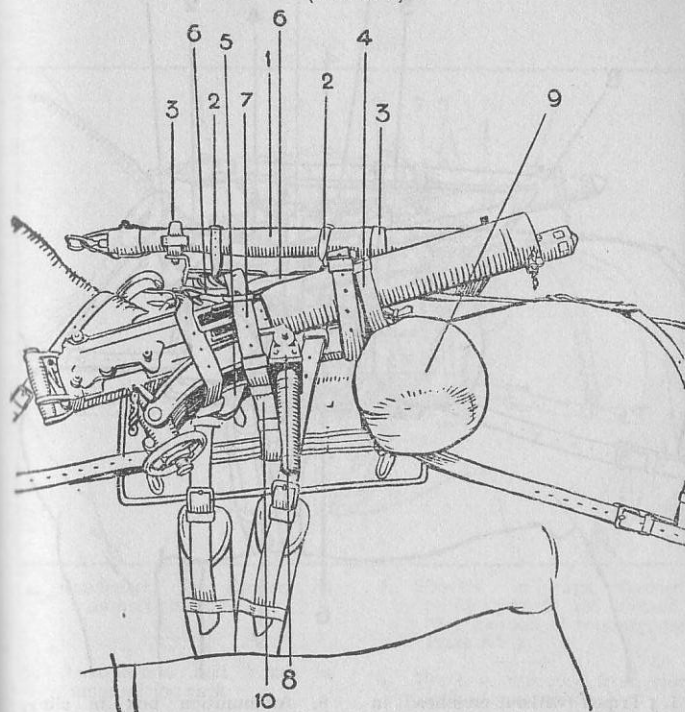
No. 4 removes the two belt boxes from the near side and the condenser, and takes up a suitable position in readiness to form an ammunition chain between the gun and pack horses. He will pass the condenser up to No. 2 through No. 3. During training, he should frequently be practised in removing all the ammunition from the pack and forming a small dump.

4. To come out of action.

Section leader—"Cease firing."

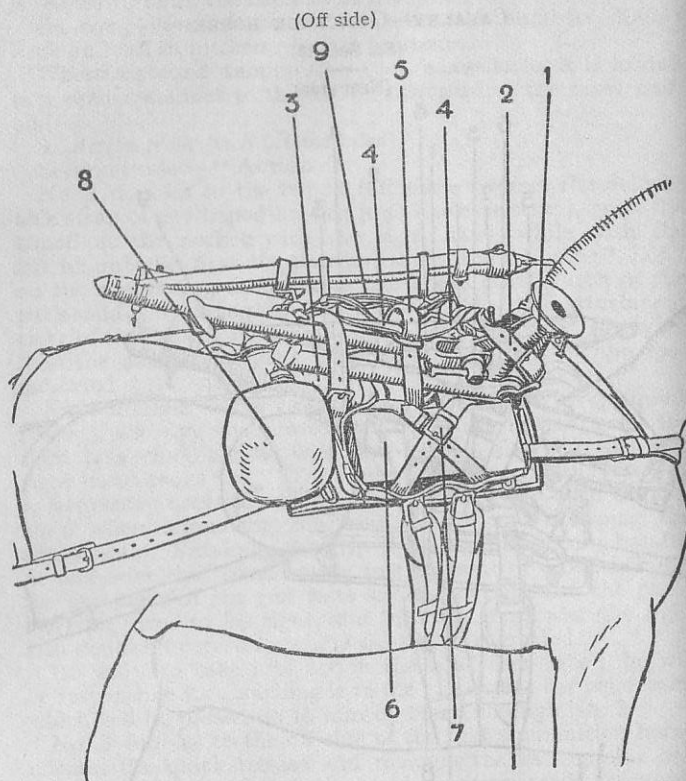
The detachment will cease firing as in drill, and the led horses will be brought up as close as possible.

PLATE IX
CAVALRY—GUN PACK HORSE
(See Sec. 29)
(Near side)



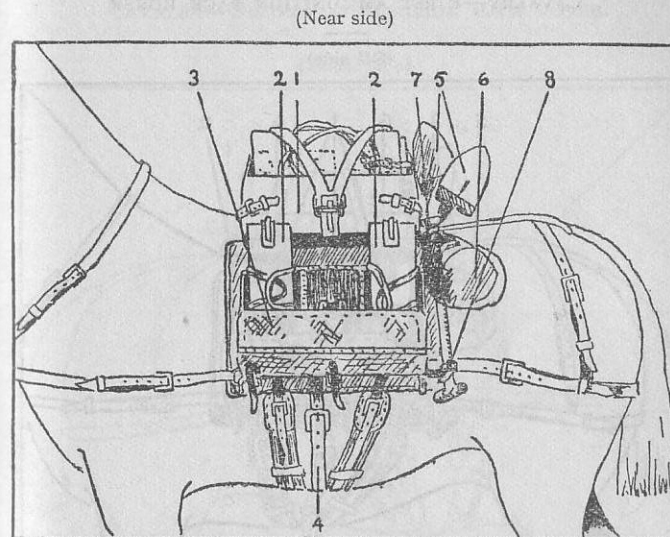
1. Spare barrel in case, resting in bracket of pack saddle.
2. } Straps of spare barrel case buckled to the rod connecting the two arches of the pack saddle.
3. } Brackets bolted to extension pieces of pack saddle.
4. Rear gun rest.
5. Front suspending pad of gun hanger.
6. } V-sling of gun hanger.
7. Gun rest strap brought through the "lay" of the pannel and engaged with the triangular buckle of the V-sling attachment.
8. Crosshead of tripod attached to the gun.
9. Nosebag suspended from rear arch of the pack saddle.
10. Forward gun rest.

PLATE X
CAVALRY—GUN PACK HORSE



1. } Tripod (without crosshead) in tripod hanger.
2. Front suspending strap of tripod hanger.
3. Rear suspending pad on tripod hanger.
4. } V-sling attachment of tripod hanger.
5. Detachable strap of tripod hanger brought through the lay of the pannel and engaged with the triangular buckle of the V-sling attachment.
6. Ammunition box in sling, box, ammunition, in belt, cavalry.
7. } Strapping, forming the sling, box, ammunition, in belt, cavalry.
8. Nosebag suspended from rear arch of the pack saddle.
9. Shoe case suspended between the front and rear arches of the pack saddle.

PLATE XI
CAVALRY—FIRST AMMUNITION PACK HORSE

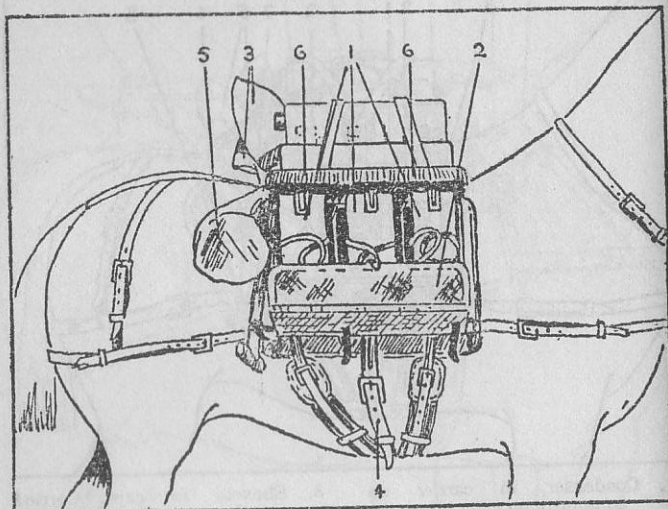


1. Condenser, in carrier on ammunition rack.
2. } Ammunition belt boxes in ammunition rack.
3. Rack, boxes, ammunition, in belt, Mark III.
4. Girth, leather, buckled to ammunition rack.
5. Shovels, in caps. Carried heads upwards and crossed. (For method of crossing, see Plate XV.)
6. Nosebag suspended from rear arch of pack saddle.
7. Detachable strap of the shovel cap securing the shovel head to the rear arch of the pack saddle.
8. Strap, detachable, shovel, looped to link on the pannel and then brought round the shovel handle.

PLATE XII

CAVALRY—FIRST AMMUNITION PACK HORSE

(Off side)

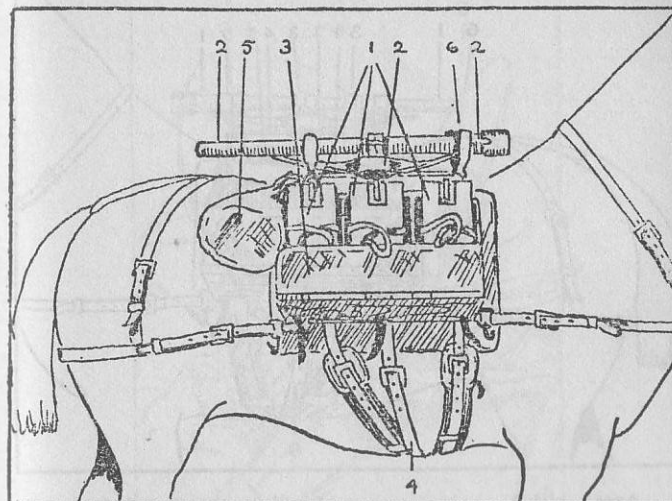


1. Ammunition boxes in ammunition rack.
2. Rack, boxes, ammunition, in belt, Mark III.
3. Shovels, in caps, carried heads upwards and crossed. (For method of crossing, see Plate XV, and for securing, Plate XI.)
4. Girth, leather, secured to ammunition rack.
5. Nosebag suspended from rear arch of pack saddle.
6. } Case, can, oil, as seen from
6. } the off side.

PLATE XIII

CAVALRY—SECOND AMMUNITION PACK HORSE

(Either side)

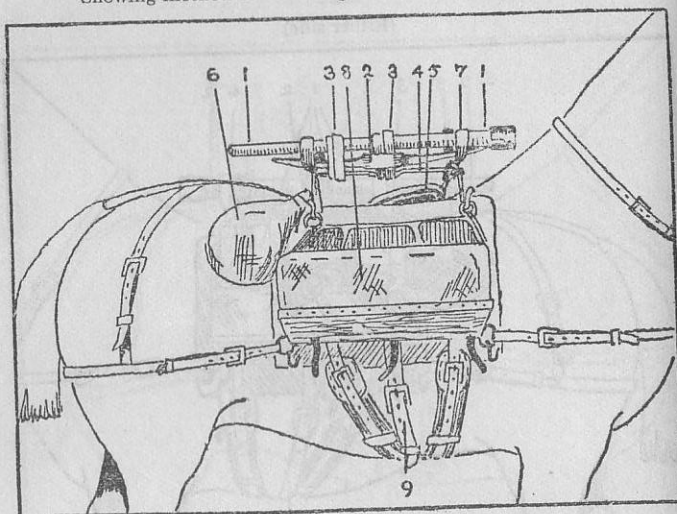


1. Ammunition boxes in ammunition rack.
2. } Helve and pick resting in
2. } brackets of pack saddle.
3. Rack, boxes, ammunition, in belt, Mark III.
4. Girth, leather, secured to ammunition rack.
5. Nosebag suspended from rear arch of the pack saddle.
6. Front bracket bolted to extension piece of pack saddle.

PLATE XIV

CAVALRY—SECOND AMMUNITION PACK HORSE

Showing method of attaching articles enumerated below



1. Axes, pick, helve.
2. Axes, pick, head.

Resting in brackets of pack saddle.

3. Straps, detachable, pick and helve, securing the pick head and helve to the rod connecting the front and rear arches of the pack saddle.

4. Rod connecting the front and rear arches of the pack saddle.

5. Shoe case suspended from the front arch of pack saddle. (This method obtains also for the first ammunition horses.)

6. Nosebag suspended from rear arch of the pack saddle.

7. Front bracket bolted to extension piece of the saddle.

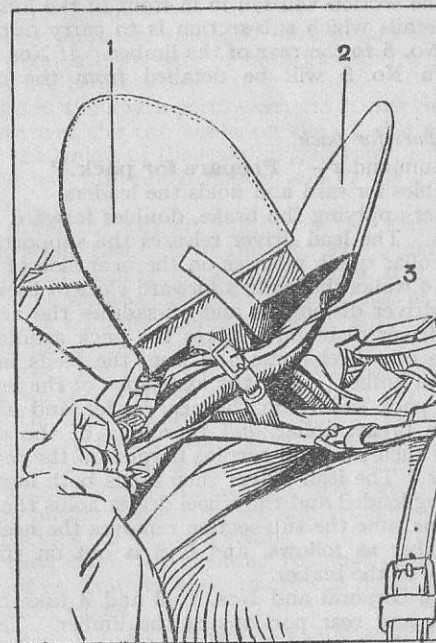
8. Rack boxes, ammunition, in belt, Mark III, slung to the hooks of the pack saddle.

9. Girth, leather, buckled to the ammunition rack.

PLATE XV

PACK SADDLE—CAVALRY

Showing method of crossing the shovels over the horse's back.



1. Shovel in the shovel cap, placed in position from the off side.

2. Shovel in the shovel cap, placed in position from the near side.

3. Detachable strap of the shovel cap brought round the handle of the shovel below the pan and then secured to the rear arch of the pack saddle. Both shovels are similarly secured.

Section leader—"Load pack."

The numbers will load the packs as in paragraph 2, above.

30. Pack saddle drill—Infantry

(See Sec. 20, Plates XVI to XIX (pp. 102 to 105), and Appendix IV.)

NOTE.—The section will fall in in front of the limber. The instructor details which sub-section is to carry out the drill, and moves No. 5 to the rear of the limber. If Nos. 5 are not on parade, a No. 5 will be detailed from the other sub-section.

1. To prepare for pack.

Section commander—"Prepare for pack."

No. 4 doubles forward and holds the leaders.

No. 5, after applying the brake, doubles forward and holds the wheelers. The lead driver releases the supporting straps and breast collar quick releases on the near side of each lead horse. No. 4 walks the leaders forward clear of their harness.

The lead driver dismounts and off-saddles the near leader. The wheel driver dismounts, takes the pack saddle and two feeds off the off wheel horse and puts the feeds in the rear portion of the limber; with the assistance of the lead driver, he puts the pack saddle on the near leader, and adjusts the packsaddlery breast collar and breeching of the off leader. Both drivers then place all surplus harness in the rear portion of the limber. The lead driver then holds both leaders while they are being loaded and the wheel driver holds the wheelers.

At the same time the sub-section removes the necessary kit from the limber as follows, and lays it out on their corresponding side of the limber.

The section corporal and Nos. 1, 2 and 3 take the covers off the front and rear portions of the limber. The section corporal takes the tripod hanger out of the rear portion of the limber. No. 3 removes the gun hanger from the rear portion of the limber, and then removes the spare parts case, condenser, and case, can, oil, from the front portion of the limber.

The section corporal, assisted by No. 3, removes the two canvas racks and four double belt boxes from the rear portion of the limber. No. 1 removes the tripod and condenser tube.

No. 2, assisted by No. 1, takes out gun chest and places it on the ground.

No. 2 removes the gun and cleaning rod from the chest.

As soon as Nos. 4 and 5 are relieved by the drivers they will move back to where the stores have been laid out. No. 4 loads one rack with four single belt boxes, and No. 5 will load

the other rack with two single belt boxes, condenser, can, and tube.

2. To load on pack.

Section commander—"On pack."

The section corporal takes forward the tripod hanger and places it on the near side of the pack saddle of the off leader.

No. 3, first removing the feed from the hook, places the gun hanger on the off side.

They then unbuckle the girth straps and rebuckle them over the wooden cross-bars of both gun and tripod hangers. The girths will be crossed.

No. 3 takes the spare parts case and hangs the sling strap of the case over the two hooks on the off side of the saddle, adjusting the length of the strap, if necessary, so that the top of the case will just touch the bottom of the gun when it is in the slings.

No. 1 takes the tripod, and, with the assistance of the section corporal, places it in the rear side slings, legs to the rear, crosshead leaning towards the front arch. No. 1 and the section corporal buckle the securing straps. Care must be taken that no inner jamming handle is turned back on to the leather panel of the saddle.

No. 2 takes the gun, and, with the assistance of No. 3, who takes up the cleaning rod, places it in the off side slings, muzzle to the rear, the front sling being passed over the feed block and the rear sling over the barrel casing.

Nos. 1 and 2 fix the straps, long and short, which are on the bars of the hangers, round the tripod legs and gun respectively, and buckle them on to the steadying strap.

No. 2 buckles the securing straps.

No. 3 then takes the cleaning rod and pushes it through the gun slings, front to rear, where the metal rings are held by the leather slings.

No. 3 takes one double belt box and places it across the saddle, the ends fitting between the gun on the off side and the legs of the tripod on the near side.

No. 2 takes the feed and places it on the top of the ammunition box, securing the strap of the nosebag to the rear arch of the saddle.

The section corporal brings forward the web surcingle, and, assisted by No. 2, passes it through the metal straps of the ammunition box, over the feed, and under the belly, securing it on the near side.

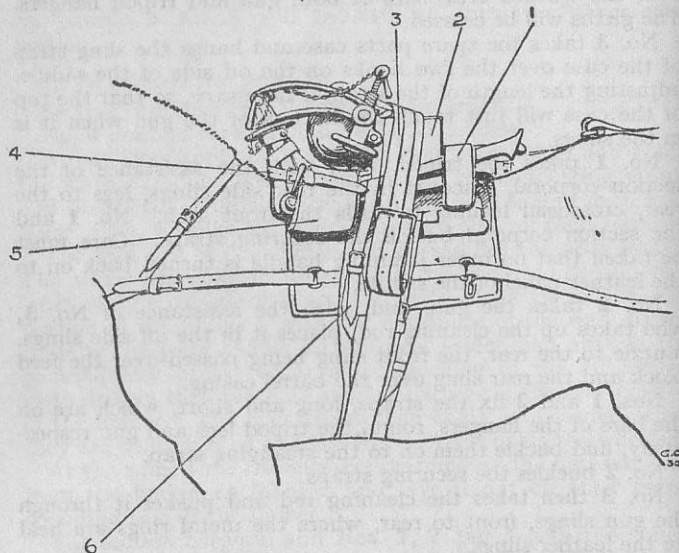
No. 4 takes forward the full ammunition rack and case, cans, oil, and No. 5 the other loaded rack, together with the surcingle and canvas bucket.

PLATE XVI

INFANTRY—GUN PACK ANIMAL

(See Sec. 30)

(Near side)



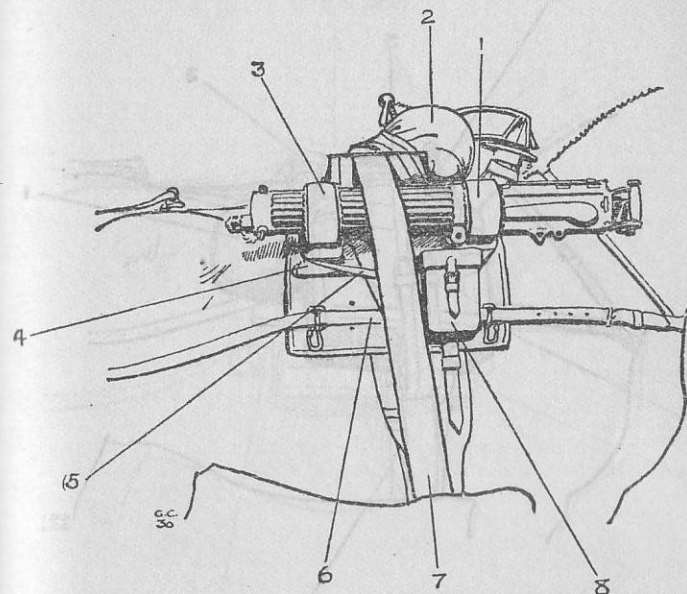
1. Rear hanger sling tripod.
2. Ammunition box.
3. Web surcingle.

4. Strap securing tripod.
5. Front hanger sling tripod.
6. Securing strap tripod legs.

PLATE XVII

INFANTRY—GUN PACK ANIMAL

(Off side)



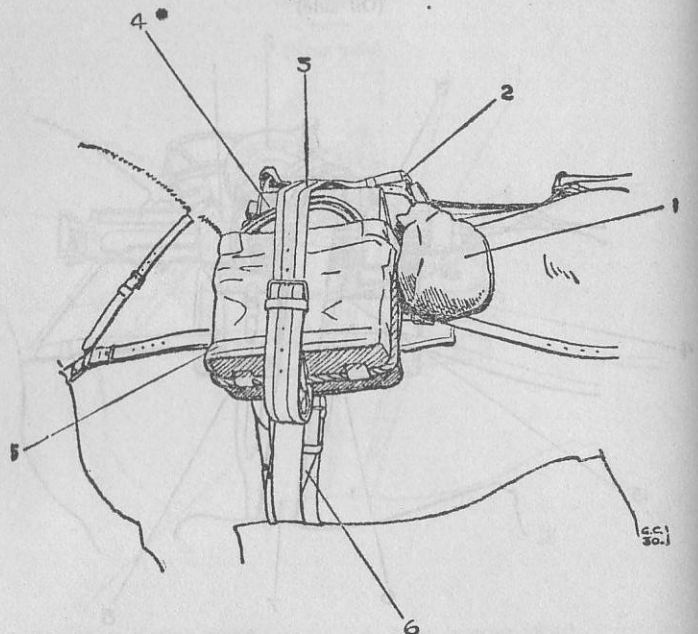
1. Front hanger sling gun.
2. Nosebag.
3. Rear hanger sling gun.
4. Hanger bar.

5. Securing strap, gun.
6. Lay on.
7. Web surcingle.
8. Spare parts case.

PLATE XVIII

INFANTRY—AMMUNITION PACK ANIMAL

(Near side)



1. Nosebag.
2. Cases, can, oil.
3. Surcingle.
4. Condenser, with tube.

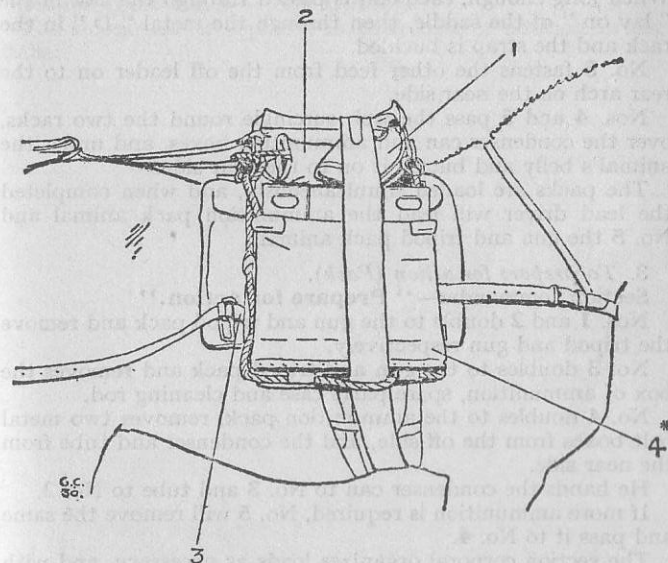
5. Canvas rack containing ammunition boxes.
6. Steadying strap (leather girths).

* With large size ammunition containers (metal), instead of two ammunition containers being packed horizontally, these will be packed vertically and the condenser carried on top of the pack saddle.

PLATE XIX

INFANTRY—AMMUNITION PACK ANIMAL

(Off side)



1. Case, horse shoe.
2. Canvas bucket.
3. Lay on.

4. Canvas rack, containing ammunition boxes.

* With large size ammunition containers, three will be packed vertically instead of four, the fourth being carried in near side rack (see note to Plate XVIII).

No. 4 places the case, can, oil, between the arches of the saddle of the near leader, passing the strap around the arches and adjusting the length of the strap as necessary.

No. 5 places the canvas bucket between the front and rear arches of the saddle, the rope handle going under the rear arch and on the rear off side hook of the tree.

Working together, No. 5 on the near side and No. 4 on the off side hang the racks on the pack saddle hooks, the metal "D's" on the bottom of the racks being nearest to the animal. They fasten the steadying strap (leather girth). When long enough, each end is passed through the slot in the "lay on" of the saddle, then through the metal "D" in the rack and the strap is buckled.

No. 5 fastens the other feed from the off leader on to the rear arch on the near side.

Nos. 4 and 5 pass the web surcingle round the two racks, over the condenser can and ammunition boxes, and under the animal's belly and buckle it on to the near side.

The packs are loaded simultaneously, and when completed the lead driver will lead the ammunition pack animal and No. 5 the gun and tripod pack animal.

3. To prepare for action (Pack).

Section commander—"Prepare for action."

Nos. 1 and 2 double to the gun and tripod pack and remove the tripod and gun respectively.

No. 3 doubles to the gun and tripod pack and removes the box of ammunition, spare parts case and cleaning rod.

No. 4 doubles to the ammunition pack, removes two metal belt boxes from the off side, and the condenser and tube from the near side.

He hands the condenser can to No. 3 and tube to No. 2.

If more ammunition is required, No. 5 will remove the same and pass it to No. 4.

The section corporal organizes loads as necessary, and with No. 5 squares off all loose gear and straps after the stores have been removed.

4. To come out of action (On pack).

Section commander—"Cease firing."

Nos. 1, 2 and 3 cease firing as in Elementary gun drill.

When signalled for, the pack animals, under orders of the section corporal, move forward to a position immediately in rear of the gun position, and the packs prepared to receive the equipment.

Section commander—"On pack."

The numbers will load the stores on to the pack animals already given for "On pack" from limbers.

5. On limber from pack.

Section commander—"Off pack."

The driver holds both animals.

All stores will be removed from the pack saddles by those numbers who loaded them, and laid out ready to be stowed in the limbers.

Nos. 4 and 5 take over the animals as in Prepare for pack.

Drivers take the harness from the rear portion of the limber and replace it on the animals.

Section commander—"On limber."

The stores will be replaced in their correct position in the limber.

CHAPTER V

FIELD DUTIES

31. *Platoon and section areas—Concealment*1. *Platoon areas.*

i. These are generally selected by the company commander, who must satisfy himself that the task can be carried out from the area detailed. In order to reduce the time required for reconnaissance by the platoon commander such areas should be as well defined as possible.

It should be remembered that a platoon may require as much as 300 yards of front, and that platoons must be placed a reasonable distance apart. Therefore the number of platoons that can be accommodated, even in indirect fire positions, on a particular piece of ground with reasonable safety from artillery fire is limited.

ii. The platoon commander reconnoitres his platoon area with a view to selecting section areas, platoon headquarters and a tactical observation post.

In deciding on section areas for direct fire the platoon commander will look for ground offering the following advantages:—

- (a) Suitable for the task.
- (b) Covered approaches.
- (c) Concealment for guns.

2. *Section areas—(Direct fire).*

The section commander reconnoitres his area for gun positions and a fire control observation post. In coming to a decision he will look for positions offering advantages as in para. 1, ii, above.

To prevent unnecessarily exposed positions being selected, it is essential that he is clear as to the exact nature of his task and the near limit of arc.

3. *Indirect fire positions.*

In this case the commander reconnoitres for a fire control observation post whence he can see the target and a possible gun line.

In selecting a gun line the commander is influenced by two considerations:—

- i. Crest clearance (Sec. 60).
- ii. Enemy observation. (This may be from the flanks.)

4. *Concealment.*

i. When immediate machine-gun support is required, gun positions will be selected that enable the task to be carried out with minimum delay.

On such occasions there may not be sufficient time to reconnoitre for the best positions. The object is to produce the required fire as soon as possible, if necessary at risk to the machine guns, although every effort must be made to obtain concealment, or to move from an exposed position at the first opportunity.

ii. When there is sufficient time to reconnoitre for the most suitable positions offering concealment, and thereby opportunity for surprise, full consideration must be given to the enemy's observation. Obvious landmarks, such as conspicuous small woods, hedges, etc., may give cover from view, but they and their vicinity should be avoided if likely to attract enemy artillery fire. Positions in the open and clear of landmarks, provided their occupation is unobserved, are preferable to those under inadequate cover that will be likely to draw artillery fire.

iii. All ranks must realize that a well-concealed position is easily disclosed by the movement of individuals within or about the area. It is therefore essential that personnel, such as commanders, observers, range-takers and orderlies, who in the course of their duties must either be in exposed parts of the area or move in its vicinity, are trained to take adequate precautions. Carelessness during preliminary reconnaissance may disclose the positions.

iv. *Camouflage.*

Gun positions and observation posts must be camouflaged at the earliest opportunity, so as to conceal them from both air and ground observation.

In considering camouflage from air observation it should be remembered that newly turned earth and blast marks require particular attention. If tracks to and from the guns cannot be avoided, they must be cut down to a minimum, and steps should be taken to continue them beyond the gun position.

5. *Fire control observation post.*

i. The position of a fire control observation post is governed by technical considerations (Sec. 68, 6, ii and iv), but every effort must be made to keep it inconspicuous.

ii. The requirements are:—

- (a) Good covered approach.
- (b) Accommodation for the required number of men.
- (c) Concealment to enable fire control signals to be made.

6. Tactical observation post.

The position selected should give adequate view of the enemy positions or lines of approach and ground over which our own troops may move.

The requirements are similar to those for fire control observation posts.

32. Occupation of a position—Day

NOTE 1. This and the subsequent sections are arranged to meet ordinary conditions. It is left to the commander to decide, in accordance with the situation, whether he can dispense with any detail or alter procedure.

NOTE 2. Cavalry.

The following field duties are generally applicable to the equivalent ranks in the cavalry, except where marked with a black line in the margin. Any modifications required for cavalry will be found at the end of each section.

1. Duties prior to and during the move.

i. The platoon commander.

(a) Goes ahead to maintain touch with the rifle company which he is supporting, with a view to engaging targets as required; or

(b) Goes ahead to reconnoitre an area in which he has been ordered to occupy a position.

In case (a) he details a line of advance for the platoon which will bring it forward through successive probable fire positions.

The platoon commander is responsible that the platoon does not become involved in minor opposition.

In case (b) he details a covered line of advance and a rendezvous.

In both cases he will give information as to the role of the platoon and his own movements.

He will issue any instructions which, from his knowledge of the ground or previous reconnaissance, may assist the platoon serjeant during the forward movement. Where possible he will be accompanied by an orderly.

ii. The platoon serjeant.

Moves the platoon forward in accordance with orders, in case (a) by bounds from fire position to fire position, in case (b) direct to the rendezvous.

During the movement and at the rendezvous he is responsible for:—

Knowing the movements of, and watching for signals from, the platoon commander.

Local protection.

Use of ground.

Formation of platoon.

Movement and position of vehicles.

Action in case of surprise.

When it is necessary to move the limbers by a route other than the line of advance of the platoon he will detail an N.C.O. to accompany them.

The latter will receive orders on the following points:—

Route.

Time to start.

Pace of movement.

Where he is to rejoin the platoon (pointed out if possible).

2. The platoon commander's duties on decision to occupy a position:—

i. Having ascertained the position of our own troops, the nature and extent of the target, and decided on the number of guns and the amount of ammunition required to engage it, he reconnoitres for a platoon area from which there is no immediate overhead problem.

Where it is necessary to use the whole platoon, and direct fire is to be employed, he decides on:—

Section areas.

Arrangements for local protection.

Arcs of fire (if required).

A position in readiness for each section.

The position of platoon headquarters.

ii. He rides back to the platoon, which is either moving on its line of advance or is at a rendezvous.

He then gives the platoon the situation very briefly and sends platoon headquarters and section commanders, with their orderlies and range-takers, to a rendezvous near the position at which he intends to give out his orders.

He gives orders to the section corporals which will include:—

The position in readiness for each section and the routes to them.

The amount of ammunition required at the guns.

The position to which the limbers are to go after unloading.

Time may be saved if the platoon commander instead of riding back, sends a message to the platoon serjeant indicating:—

A forward platoon rendezvous.

His own movements, and if possible a rendezvous for platoon headquarters and section commanders.

iii. He then proceeds to the position to which he has sent the platoon serjeant and gives orders as under :—

To the platoon serjeant and section commanders.

Information and intention.

1st target and/or arcs of fire.

Section areas.

Positions in readiness.

That it is safe to fire.

When fire is to be opened.

Rates of fire.

Arrangements he is making for local protection.

Position of platoon headquarters.

(Having received these orders the section commanders, accompanied by their range-takers and orderlies, move to their respective areas.)

To platoon serjeant—The duties he is to carry out.

To observer—1st target and arcs of fire.

Any special orders for watching and locating the enemy or own troops.

To scouts—Orders for local protection.

It may be possible to give some or all of these orders at the same time as those to the section commanders.

In exceptional circumstances, for example, when it is necessary to rush guns up to a position, an adaptation of "Mounted action" described in Sec. 37, 3, might be employed.

3. Duties during the occupation of the position :—

i. *The section commander of each section.*

On arrival in his section area he will give orders to his range-taker, including :—

1st target.

Arc of fire.

Points to which he requires ranges.

His own control position.

He then selects :—

The section position within the area allotted to him.

His control position.

A gun position for each gun.

Reference points.

There are three alternative methods of bringing the guns into action open to the section commander :—

(a) To use the section orderly to mark one gun position while he himself marks the other one.

(b) To signal the guns up in turn, point out to each No. 1 as he arrives gun position, 1st target, arc of fire and reference points.

(c) To go back and bring forward Nos. 1 with tripods as far as cover allows and point out gun positions, etc., as in sub-para. (b), above.

He sends the orderly to platoon headquarters.

ii. *The section corporal of each section.*

According to the orders he has received from the platoon commander :—

(a) Moves the section to its position in readiness.

(b) Details amount of ammunition required, and numbers to carry ammunition above normal.

(c) On arrival at position in readiness, orders "*Prepare for action.*"

(d) Gives limber driver a definite point to which he will return when signalled for, and sends limber to covered position.

(e) Keeps touch with section commander, and when he receives an indication of the section position from the movements of the section commander, orders the guns and equipment to be carried as far forward as ground permits.

(f) Orders guns into action when signalled for.

4. Duties in action.

i. *The platoon commander.*

(a) Keeps in touch with the tactical situation, carrying out a forward reconnaissance where necessary.

(b) Sends fire direction orders as required.

(c) Reports to company headquarters regarding the tactical situation, the ammunition state, etc.

He may delegate some of these duties to the platoon serjeant.

ii. *The platoon serjeant.*

Acts as 2nd-in-command to the platoon commander, carrying out any of the above duties as required.

iii. *The section commander.*

Controls the fire of his section.

Interprets fire direction orders he receives from platoon commander.

Locates and deals with targets within his arc.

Solves safety problems as they arise.

Makes arrangements to continue firing in case observation is at any time interrupted.

iv. *The section corporal of each section.*

Supervises the supply from the limbers to the gun position, and maintains communication between them.

5. Modifications for cavalry.

i. Duties on decision to occupy a position.

The troop leader.

Having detailed a troop rendezvous in accordance with para. 2, ii, above, two courses are open to him, either :—

- (a) To order the second serjeant to take all the vehicles to a position in readiness ; or
- (b) To order section leaders to separate positions in readiness. In this case he must give orders to the second serjeant as to the disposal of the troop vehicle and its personnel.

In both cases he will order :—

The amount of ammunition required.

The positions under cover to which the vehicles are to go after unloading.

ii. Duties during the occupation of a position.

The section leader of each section.

Gives order "*Prepare for action*" as the vehicle nears the section area. He selects his exact position in readiness and indicates it to the driver. He orders "*Dismount*" and informs the driver where to go when unloaded. In all other respects he carries out the duties given for a section commander in para. 3, i, above.

The senior No. 1 of each section.

Keeps touch with the section leader, and when he receives an indication of the section position from the movements of the section leader, orders the guns and equipment to be carried as far forward as the ground permits. He orders guns into action when signalled for.

iii. Duties in action.

The second serjeant.

Will, in accordance with orders from troop leader :—

- (a) Carry out any of the duties of the troop leader delegated to him ; or
- (b) Command one of the sections in action ; or
- (c) Supervise the supply from the vehicles to the gun positions and organize the personnel of the troop vehicle.

33. Modifications for indirect fire

1. The platoon commander's duties on decision to occupy the position.

i. Having elected to employ indirect fire, carries out his reconnaissance and decides on :—

Position of the observation post.

The gun line and gun frontage.

Arrangements for local protection.

The method to be used, and, if necessary, which will be the pivot gun.

Position of platoon headquarters (normally near position from which he is going to observe).

Position in readiness for the platoon.

Amount of ammunition required.

ii. He then either sends back his orderly with orders or goes back to the platoon and gives verbal orders to all N.C.Os.

The orders will contain the following :—

The situation briefly.

The line of advance.

The method of indirect fire he intends to employ.

Instructions for platoon serjeant, platoon headquarters and one range-taker to move forward to the area in which the position will be.

(The platoon serjeant takes with him the instruments, etc., which are required.)

Instructions to senior section commander to move the platoon to the position in readiness.

Instructions to the senior section corporal as to covered position for limbers.

The amount of ammunition required.

iii. He then returns to the position to which he has sent platoon headquarters, and gives information and orders which will include the following :—

To range-taker—

1st target.

Other points to which ranges are required.

To observer and scouts—

As for a "direct fire position."

To platoon serjeant—

Full information.

Observation post.

Gun line.

Gun frontage and pivot gun if necessary.

Position of platoon headquarters.

iv. He will then establish an observation post and proceed with calculations for engaging the target.

Where there is a risk of the gun line being exposed to air observation the guns should not be brought up until the last possible moment.

2. Duties during the occupation of the position.

i. *The platoon serjeant.*

Having received the platoon commander's orders, supervises the guns coming into action and carries out the duties laid down for him in Drill duties—Indirect fire.

When the section orderlies report to him he sends one to platoon headquarters and keeps the other himself.

ii. *The senior section commander.*

Moves platoon to the position in readiness, and on arrival orders—"For indirect fire—Prepare for action."

Orders the amount of ammunition to be taken out of the limber, and, if above normal, details loads to higher numbers.

Gains touch with the platoon serjeant at the gun line, and moves the platoon forward to a position in rear of the gun position.

Carries out the duties laid down for him in Drill duties—Indirect fire.

iii. *The junior section commander.*

Assists the senior section commander during the move to the position in readiness.

Carries out the duties laid down for him in Drill duties—Indirect fire.

iv. *The senior section corporal.*

Sends the two section orderlies with a director and one range-taker forward to the platoon serjeant.

Moves limbers from the position in readiness to the covered position.

Organizes supply from limbers to the gun line, making use of junior section corporal as necessary.

3. Duties in action.

i. *The platoon commander.*

As in a direct fire position, except that normally he will control the fire of the platoon.

As before, he may delegate any of his duties to the platoon serjeant. Where this entails the platoon serjeant leaving the gun line, the senior section commander will carry out the platoon serjeant's duties at the gun line, and the section corporal of that section will take the place of the senior section commander.

ii. *The platoon serjeant.*

Commands at the gun line, and reports S.A.A. state to platoon commander.

Carries out such duties as are laid down for him in Drill duties—Indirect fire.

Will be prepared to carry out any of the platoon commander's duties when ordered.

iii. *The section commanders.*

Carry out such duties as are laid down for them in Drill duties—Indirect fire.

The senior section commander will be prepared to carry out the duties of platoon serjeant if required.

iv. *The section corporals.*

Supervise and control the supply from the limbers to the gun line.

Will be prepared to command their sections in action should their section commander be in command of the gun line.

4. Cavalry.—The duties marked in the margin in this section as not applicable to cavalry are covered by the modifications for cavalry in Sec. 32.

34. Modifications for an immediate overhead problem

1. Duties prior to the move on to the position.

Before a decision can be made to occupy a position, it must be ensured that it is safe to open fire from it over the heads of our own troops.

The platoon commander.

i. Makes rough reconnaissance for probable positions, direct or indirect, and decides on the most favourable for safety as regards own troops.

ii. Returns to the platoon or sends a message.

iii. Orders forward a reconnaissance party consisting of a range-taker, observer, orderly and batman-groom to a rendezvous near the proposed position.

Gives platoon serjeant the situation briefly if not already done, and orders him to move the platoon to a forward rendezvous.

iv. He then returns to the rendezvous to which he has sent the range-taker, etc., and orders:—

Range-taker—To obtain range to target and own troops.

Observer—To watch the enemy and own troops.

v. When the range-taker has obtained the necessary ranges the platoon commander will solve the overhead problem from that part of the probable position which is least favourable. When firing direct he will instruct the range-taker to rejoin his section commander.

vi. If it is safe to fire he will carry out the necessary detailed

reconnaissance for the occupation of the position and issue orders for its occupation in the normal manner.

2. Cavalry.

Reference para. 1, iii, reconnaissance party consists of a range-taker and the troop observer.

35. Occupation of a position—Night

1. Duties where preliminary reconnaissance can be carried out by daylight.

i. Duties prior to occupation. (See also Secs. 28 and 61.)

The platoon commander will take with him on his reconnaissance as a minimum :—

1 range-taker.

1 orderly with director and pegs.

If possible, section commanders should be taken forward to view the ground by daylight, when the orderly may not be required.

Having chosen the exact position or positions for the platoon, the platoon commander will instruct the range-taker to take the necessary ranges. He plants pegs as required. (See Sec. 61.)

He will select positions in readiness for the sections, and point them out to the section commanders if present.

If section commanders are not present, and the section positions are widely separated, he also chooses a forward rendezvous.

ii. Duties on occupation of the position.

If section commanders were present during the reconnaissance, they will lead their sections direct to their position in readiness, and come into action.

If section commanders were not present, the platoon commander will lead the platoon to the forward rendezvous or to one of the positions in readiness.

He will take forward one of the sections, and will point out to the section commander his position in readiness and the gun and direction pegs. He will then return to the place where he left the other section, lead it to its position in readiness, and point out gun and direction pegs to section commander as above.

The section commanders send guides to lead their sections from positions in readiness, and carry out duties as in Section drill—Night firing.

2. Duties when no daylight reconnaissance is possible.

It is possible to arrange for fixed lines with fair accuracy

at close ranges provided that a light can be shown on the place where the fire is to fall.

The platoon commander will choose positions for his sections either off the map or by personal reconnaissance.

He will proceed with a torch to the place or places where he requires the fire of the section, and expose the light in the direction of the guns.

The range-taker at the guns will take the range to the light, and the Nos. 1 lay for direction with day sights. The angle of sight will be taken with the director. On completion, a light signal may be fired from the gun position.

Elevation is placed on the gun with the clinometer.

36. Duties special to defence

1. Duties on decision to occupy a position.

i. The platoon commander.

In defence, when section positions are widely separated, time can be saved by first giving orders to the section that has least distance to move.

In addition to the points already given in Sec. 32, 2, iii, the platoon commander should, as far as possible, include in his orders :—

Position of our own troops, in the vicinity of both the section areas and the arcs of fire.

Details of fixed line.

Rates of fire, signal for S.O.S., and the direction from which the latter will be put up.

Any special orders for local protection and concealment (e.g. he may place certain scouts under orders of a section commander).

Orders as to digging.

Alternative positions.

The place to which the limbers are to be sent when the position has been occupied.

Communications.

Normally, he will direct the section commanders to occupy the position for arc only, and give them the position of their fixed lines later.

Where possible he will order the platoon serjeant to get in touch with the rifle units in the immediate vicinity of the section areas, and make arrangements for local protection, liaison and safety problems.

ii. The section commander.

The section commander, in addition to his normal instructions, will order the range-taker to construct a range card for

the arc. This card should contain ranges to all the prominent points in the arc, including near ranges, and be so full that the services of the range-taker can be dispensed with once the position is occupied.

2. Duties in the occupation of the position.

i. *The platoon commander.*

Having given his orders, he will proceed to the rifle locality or localities for the protection of which he is responsible. He will arrange with the commander of the rifle unit concerned the best position for the fixed lines and ascertain that there are no troops unsafe by flanking or overhead fire along the proposed lines of fire.

On return to the section positions he will give orders in detail as to fixed lines and any of the points in para. i, above, not already sufficiently dealt with.

He reports to company commander when all arrangements are complete.

ii. *The commander of each section.*

He may receive the exact details for his fixed line from the platoon commander either before or after the guns are in action. In either case he will take steps to have the guns laid on this line at the earliest possible moment, and order them to be half loaded. He will see that fire can be opened on the fixed line quickly and maintained under all conditions of light.

On arrival at the position he will order his guns to be mounted to cover the arc in the normal manner, and—

Post sentries and look-outs.

Arrange for local protection and concealment.

Instruct all ranks as to S.O.S. signal, the direction from which it is to be put up, and action in case of S.O.S.

As soon as the range-taker has completed the framework of the range card, point out to N.C.Os. and men arc of fire, reference points, the position of our own troops and near ranges.

Organize digging parties to provide cover for the guns and the control position.

Inform the section corporal where to send the limber.

Send the orderly to platoon headquarters to report that the section is in position and to remain there.

As soon as time permits he will also—

Choose an alarm post, inform all ranks of its position, signal for occupation and action to be taken.

Ensure that all ranks have full information.

Make out a duty roster for sentries by day and by night.

Gain touch with the rifle companies in his immediate vicinity and ascertain further details as to patrols, etc.

iii. *The section corporal of each section.*

He will order gun chests, all ammunition, spare parts box, spare oil, indirect fire and night firing stores, signal pistol and tools, to be unloaded from the limber and placed in position near the guns.

Send limber to rear position.

Reconnoitre for spare water for the guns, and inform the section commander of its position.

3. Supporting guns.

The orders for, and sequence of, the occupation of the position will be the same as for forward guns.

If the platoon commander has been given the task of firing in front of the foremost localities, his liaison duty is to ascertain the position of our own troops in his line of fire.

All commanders of supporting gun platoons must get in touch with the troops in the vicinity of their positions.

After guns are in position they will be half loaded as for forward guns. In the case of guns which have a task in front of the forward localities, they will be kept laid for these tasks.

4. Reserve guns.

Reserve gun platoon commanders, if ordered to support a counter-attack, will get in touch with the rifle company commander concerned.

All reserve gun platoon commanders will arrange for reconnaissance of positions to protect reserve localities.

5. Cavalry.

The duties of the section corporal above are carried out by the second serjeant or senior No. 1, according to circumstances.

37. *Duties special to rear guard action*

1. *The occupation of the position.*

Since the section areas are chosen largely for the facilities they give for quick and covered withdrawal, the position to which the limbers will return when signalled for should be notified to section corporals by the platoon commander at the time when he gives out to them the position in readiness. If this is not possible, the section commander will choose the position for his limber and inform the section corporal before the latter marches back the spare numbers and limber. In other respects the occupation of the position is normal.

2. In action.

The platoon commander.

Previous to withdrawal he reconnoitres the line of retirement. If he has not the time to carry out this reconnaissance, he may delegate all or a part of it to the platoon sergeant. He will also instruct the latter to reconnoitre for the next position.

He issues verbally, or by orderly, preliminary orders as follows :—

- i. Line of retirement.
- ii. Next task or rendezvous.
- iii. How he intends to give the order to withdraw (personally, in writing, or by signal).
- iv. Orders for withdrawal of platoon headquarters.

If the situation is such that he can decide on the following points at this time, he will also include :—

- v. Orders as to which section will withdraw first in the case where both sections are not to withdraw together.
- vi. Instructions as to whether the withdrawal is to be carried out mounted, and if so a rendezvous for the higher numbers.
- vii. Any instructions as to keeping touch with himself during withdrawal.

3. The withdrawal.

The platoon commander.

Gives personally, or sends, the order to withdraw, including any of the orders contained in v, vi and vii, above, which he has not already given.

It may be his intention to move either both sections together or one section at a time.

When he wishes the retirement to be carried out in the normal manner, he will order "**Cease firing**"—"On **limber**" and detail next task or rendezvous.

If he wishes both or either section to withdraw mounted, he will first order "**Prepare to move mounted**," followed by "**Move.**" In this case the section or sections will act as follows :—

"**Prepare to move mounted.**"

The section commander.

Signals for the limber, sends back the range-taker or orderly as required, informs the section corporal the amount of ammunition he requires left at the gun position, and ensures that he has final orders.

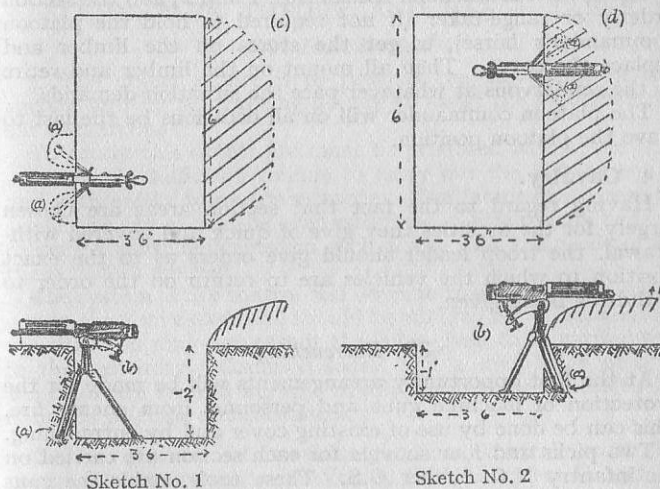
The section corporal.

Orders limber to the prearranged position, turns it round

PLATE XX

HASTY M.G. EMPLACEMENTS OF RIFLE SLIT TYPE

(See Sec. 38.)



- Sketch No. 1
- Sketch No. 2
- (a) Slight undercut, can be revetted with wooden slats from Ammunition Box.
 - (b) Gun mounted in highest position.
Emplacement No. 1—2 men—time $1\frac{1}{2}$ hours } approximate.
Emplacement No. 2—2 men—time 1 hour
 - (c) Crest line of parapots may be carried round trench on exposed flank.
 - (d) Crest line of parapet may be carried round trench on exposed flank.

[See also Manual of Field Works (All Arms).]

and assists the spare numbers to take off the cover, take out the gun chests and lay them on the ground. He orders them to take up to the position whatever ammunition is required.

Having seen the stores in the limber squared off, he then falls in the whole section, except Nos. 1 and 2 of each gun, and the orderly or range-taker, and marches them back to the rendezvous. He details a fresh No. 1 and No. 2 to take over as soon as the guns arrive back.

"Move."

The section commander assists Nos. 1 and 2, and the section orderly or range-taker (if not required to hold the platoon commander's horse), to get the stores on the limber and replace the cover. Then all mount on the limber and retire to the rendezvous at whatever pace the situation demands.

The platoon commander will on all occasions be the last to leave the platoon position.

4. Cavalry.

Having regard to the fact that section areas are chosen largely for the facilities they give of quick and covered withdrawal, the troop leader should give orders as to the exact position to which the vehicles are to return on the order to withdraw being given.

38. Entrenching

At the first opportunity arrangements will be made for the protection of machine guns and personnel from enemy fire. This can be done by use of existing cover and by entrenching.

Two picks and four shovels for each section are carried on the infantry M.G. limber G.S. These tools enable the guns and a proportion of the personnel to be dug in immediately without outside assistance.

Entrenching may be a danger if obvious to ground or air observation. Care must be taken to camouflage the work, and it should not be obvious in an air photograph.

The diagrams in Plate XX are given as a guide. The type of trench finally developed should be similar to, and viewed from the air should be indistinguishable from, the normal rifle or Lewis gun slits.

PART II

FIRE CONTROL

CHAPTER VI

ELEMENTARY THEORY AND RANGE TABLE

39. Introduction

1. The object of fire is to prevent the movement of the enemy, and by neutralizing his fire to assist the movement of our own troops.

To attain this object fire must be produced with speed and accuracy, in sufficient volume to carry out the task in hand, and with safety to our own troops. The factor of surprise as applied to fire cannot be over-estimated. Fire control orders, therefore, must be framed in such a way that the needs of all these factors are met.

The system of fire control laid down in this manual is worked out on the above basis and should be adhered to. Occasionally the situation may not permit the rules given to be carried out in their entirety. Common sense, and a knowledge of how the rules are arrived at, will enable the best fire effect to be obtained in these circumstances.

2. The student of machine-gun fire control must be thoroughly conversant with Vol. I, 1931, Chapters II and V, and, in addition, must have some knowledge of elementary mathematics.

3. Direct fire being the normal and most effective method of engaging a target, the organization and establishments are based on direct fire requirements.

i. The direct fire unit is the section, because :—

- (a) Two guns are required to give the necessary **volume** at normal machine-gun ranges.
- (b) At the longer ranges two guns are necessary to ensure **hitting** the target at the first burst, or immediately following it. (See Secs. 43 and 44.)
- (c) A section is the largest unit which can be controlled by voice under war conditions.
- (d) It can be easily concealed and is not too vulnerable.
- (e) In case of a stoppage at one gun, sustained fire can be maintained by the other.

ii. With reference to sub-para. i, (a), above, at distances beyond 1,500 yards the volume of fire produced by a section cannot be relied on to give results proportionate to the expenditure of ammunition, and the fire of two or more sections should be directed on to the same target from their respective positions.

iii. The requirements of fire control necessitate the two guns being under the command of a fire controller, who is supplied with a range-taker to enable him to determine the range.

iv. The indirect fire unit is normally the platoon, because :—

- (a) The gun line is not in view of the enemy, and therefore concealment and control of four guns is possible.
- (b) Indirect fire is usually employed at the longer ranges, when the fire of four guns is desirable to produce the requisite volume.

The section, however, carries the necessary equipment to employ indirect fire independently.

4. The need of voice control renders it advisable that in a direct fire position the two guns of a section in action should not be more than 20 yards apart. In an indirect fire position the normal gun interval is 15 yards.

40. Elementary theory

(To be read in conjunction with Vol. I, 1931, Chapter II)

1. Elevation.

i. When firing direct, elevation is given to the machine gun by setting the backsight at the graduation corresponding to the range to the target and directing the line of sight on to the point of aim. This process sets the axis of the barrel at an angle above the line of sight (Fig. 6). This is the angle of

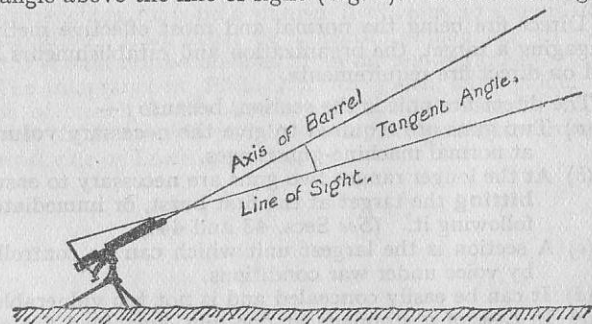


Fig. 6.

tangent elevation (tangent angle) for the range at which the backsight is set.* Tangent angles for all ranges have been determined and are laid down in the Range Table.

ii. When firing indirect, elevation or depression is placed on the gun by means of the clinometer, an instrument which measures angles with reference to the horizontal. It is necessary, therefore, to be able to express the angle of elevation given to a gun in relation to the horizontal. This angle is known as the quadrant angle, and is the angle between the axis of the barrel and the horizontal (Fig. 7).

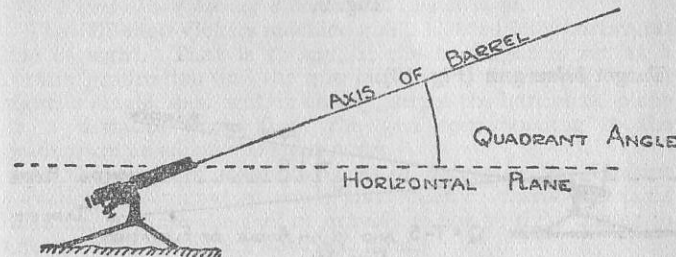


Fig. 7.

The quadrant angle is calculated from the formula :—

Quadrant angle = tangent angle \pm angle of sight. (For angle of sight, see Definition, p. 2.)

The following diagrams, which cover all cases, show how the formula is arrived at :—

Q = Quadrant angle.

T = Tangent angle.

S = Angle of sight.

Target above gun (Fig. 8).

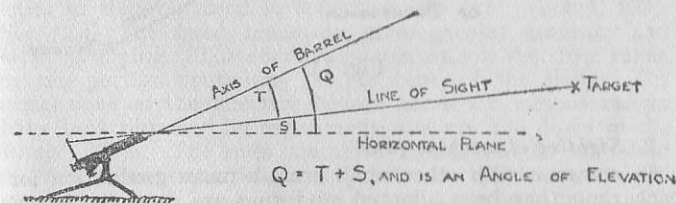


Fig. 8.

* Except where the line of sight is abnormally steep, i.e. in mountainous countries. This is explained in para. 3, below.

Target level with gun (Fig. 9).

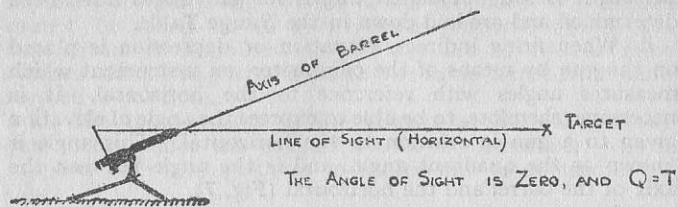


Fig. 9.

Target below gun (Fig. 10).

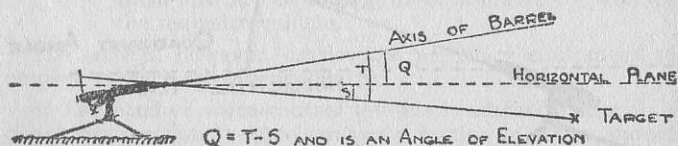


Fig. 10.

Target far below gun (Fig. 11).

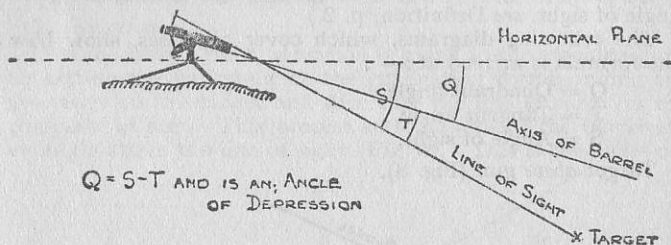


Fig. 11.

2. Sighting of machine guns.

In common with other small arms, a mean graduation for each range has been adopted, and guns are carefully tested for accuracy before issue. In course of time wear to mountings and barrels, and irregularities in packing, may require individual gun corrections to be made when setting the tangent sight for a particular range. Certain practices have been

included in Part II, A.M.G.C., which enable the gun range at 600 yards to be registered.*

On all occasions when the gun is firing ball ammunition and it is possible to determine the range with accuracy, the gun range should be noted, if possible corrected for the atmospheric conditions of the day, and recorded.

Every effort should be made to deduce the gun corrections required at various ranges, e.g. 600 yards, 1000 yards, 1500 yards and 2000 yards.

These corrections will require revision.

3. Effect of not having a horizontal line of sight.

The .303-inch Vickers machine gun is sighted for a horizontal line of sight. That is to say, if the backsight is set at a certain graduation and the gun laid with a horizontal line of sight, a single shot will, in theory, strike the horizontal plane at a distance away from the gun corresponding to the graduation at which the sight is set.

As the angle of sight increases or decreases, less tangent elevation is required to cause the bullet to travel the same distance, because the pull of gravity is not at right angles to lines of sight which are not horizontal.

This may, perhaps, be more easily understood by considering the case of firing vertically upwards or vertically downwards. Here no tangent elevation is required on the gun, as the pull of gravity acts directly along the line of sight.

For angles of sight of less than 10° elevation or depression the reduction in tangent elevation required is negligible. In mountainous countries, however, it will be necessary to set the sight at a corrected range. A chart from which the corrected range for abnormal angles of sight can be obtained is given in the Range Table. (See Sec. 41, 7.)

4. Beaten zones.

The beaten zone of the machine gun has similar characteristics to that obtained in collective rifle fire. (Vol. I, 1931, Sec. 12.) The fixed mounting gives greater accuracy and closer grouping. The effective beaten zone is therefore taken as the portion containing 90 per cent. of the shots. The dimensions of the effective beaten zones for various ranges have been obtained by experiment, and are laid down in the Range Table. The rules contained in this manual are based on these dimensions, which vary little for different guns and mountings, and hence can be taken as constant for each range.

* This is obtained by a process (described in the notes on Part II, A.M.G.C.) which is only applicable to vertical targets, e.g. the stop butt, and must not be confused with ranging. (Sec. 45.)

As in collective rifle fire, the length of the beaten zone decreases as the range increases. Beyond 2000 yards the machine-gun beaten zone again commences to increase.

Its breadth increases up to extreme range.

The fact that it is very narrow in comparison to its length calls for great accuracy in direction, and renders the gun peculiarly suited to engage from a flank targets with width and little depth.

If, however, the target has depth it may be advisable to engage it by frontal fire, so that the length of the beaten zone may be employed to cover the depth of the target as opposed to its width.

The effect of ground on the beaten zone of the machine gun is in general as shown in Vol. I, 1931, Sec. 14, for the rifle.

In addition, it should be remembered that plunging fire from a commanding position on to level ground (Fig. 12) will produce a reduced beaten zone.

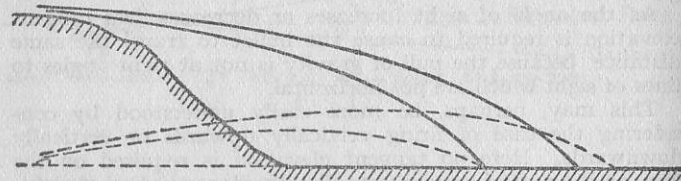


Fig. 12.

The table given on p. 9 of the Range Table has been compiled as a guide to the amount the beaten zone is reduced or increased according to the slope of the ground on which it falls.

41. The Range Table—Climatic influences

1. The Range Table of the .303-inch Vickers Machine Gun, 1931, consists of:—

- i. A table giving all the data relative to the shooting of the gun. (Page 1.)
- ii. Tables and graphs of general application to machine-gunnery.

2. Pages 2 and 3.—**Lifts, Safety angles, Minimum clearances, Temperature and Barometer corrections.**

This table contains all information which will normally be required in the preparations for engaging a target, viz:—

- i. The tangent angles for all ranges (100s and 50s).
- ii. The safety angles and minimum clearances for all ranges to our own troops.

(To assist in working out overhead problems.)

- iii. The angular amount by which each elevation has to be increased so as to add 100 yards on to the range ("lift").
- iv. The dimensions of the beaten zones at all ranges.
- v. The allowances to be made for variations in temperature and barometer. (See para. 6, below.)

3. Pages 4 to 7.—**The Wind Correction Graph and Wind Values Table.**

Referred to in para. 8, below.

4. Page 8.—**The Scale for conversion of Oblique to True Bases and the Displacement Table.**

These are of particular application to the director method of placing guns on parallel lines, and their use is fully described in Sec. 53, 7.

5. Page 9.—**Influence of Ground on Beaten Zones.**
Referred to in Sec. 40, 4.

6. Page 10.—**A formula for determining the angle of sight.** (See Sec. 58, 1, ii, (b).)

7. Page 11.—**The V.I. Graph.**

The uses of the V.I. Graph are varied, the most important being:—

- i. To determine, knowing the range, the distance or height subtended by a certain angle.
- ii. To determine, knowing the range, the angle subtended by a certain distance or height.

In Fig. 13, if G is the gun and GA the range, then AB is the distance subtended by AGB at the range GA, and A_1B_1 is the distance subtended by AGB at the range GA_1 .

Similarly, the angle AGB is said to subtend AB and A_1B_1 at the ranges GA and GA_1 respectively.

In the graph the scale giving the ranges is on the left-hand side, the angles are given by the diagonal lines, and the distances (AB, A_1B_1 , etc.) on the horizontal scale at the bottom, marked base. The method of using the graph is described above it.

It should be noted that the lowest range given on the graph is 1000 yards.

Now in Fig. 13, above, the distances AB and A_1B_1 are proportionate to their range from G, that is to say, if GA is twice GA_1 , then AB is twice A_1B_1 .

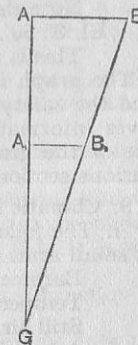


Fig. 13.

Therefore, if the range is under 1000 yards, a convenient multiple of it must be used, and the same multiple applied to the base. This is exemplified in the second example given above the graph.

On this page will be found also a formula for use instead of the V.I. Graph if desired, and a "**Chart for firing up or down hill**," which is referred to in Sec. 40, 3.

8. Page 12.—"**Graph for calculating quadrant elevation and clearances**" (The Q.A. Graph).

This graph is formed by plotting to scale the path of the centre bullet for quadrant angles, increasing by 10' increments, from depression 3° to elevation 10° 10'.

The thick, black, horizontal line marked "O" represents the horizontal line through the gun position.

The vertical lines give the ranges, which are shown on scales at the top and bottom of the graph, and the horizontal lines give heights above and below the gun position in metres, as shown on the left-hand side of the graph. As the heights used are not always in metres, a corresponding scale of yards is given on the right-hand side of the graph.

The chief use of the graph is to determine the Q.A. for targets at any height above or below the gun.

For example :—

Range to target 1600 yards.

Height of target above gun 35 yards.

Plot the target on the graph, *i.e.* run up the vertical line through 1600 on the bottom range scale, to a point directly level with 35 yards on the right-hand scale. (Above the thick, black, horizontal line.)

Note the curve which passes through this point, viz :—
El. 3° 50'.

This is the Q.A. required.

The graph is also used in connection with crest clearance and the safety of our own troops, and at the top and bottom gives information relative to the calculations of these. The use of the graph in this connection is dealt with under the various sections concerned.

9. Climatic influences.

i. The following are the normal conditions for the sighting of small arms :—

Barometric pressure. 30 inches. (Mean sea level.)

Temperature. 60 deg. Fahrenheit.

Still air.

A horizontal line of sight.

ii. Barometer and temperature.

If the barometer falls below 30 inches, less elevation than is

normally required for the distance will be necessary, as the atmosphere being less dense offers less resistance to the bullet. It should be noted that the barometer will fall 1 inch for every 1000 feet above mean sea level. If the barometer rises above 30 inches, more elevation is required, as the air is denser.

The bullet meets with less resistance in hot weather, when the temperature is high and the air less dense; and greater resistance in cold weather, when the temperature is low. In the former case, therefore, less elevation is required and in the latter more.

Allowances for barometer and temperature variations are normally small, and are not usually necessary except at great heights or under conditions of extreme heat or cold.

Allowances for 1 inch rise or fall of barometer and 10° rise or fall of temperature will be found opposite each range in Cols. 7 and 8 of pp. 2 and 3 of the Range Table. It should be noted that for a **fall** in barometer, and a **rise** in temperature the allowance to be made is subtracted and *vice versa*.

iii. Wind.

Winds blowing directly along the line of fire from front to rear will affect the elevation, but here again, unless the wind is very strong and the range long, the allowance required is small.

Winds blowing directly at right angles to the line of fire will affect direction, and have considerable effect on the bullet, particularly at long ranges.

Winds blowing from a direction oblique to the line of fire will affect both direction and elevation.

Although where speed is essential it may be necessary to estimate in taps the lateral allowance to be made for a side wind, recourse should be had to the graph in the Range Table when time permits.

On p. 4 of the Range Table is given a table showing the effect of wind of various strengths on flags, which may be of assistance in estimating the speed of the wind.

Having obtained this estimation, the allowances required may be obtained from the graph on p. 6 or 7.

The graph is constructed to deal with winds blowing directly along or at right angles to the line of fire, and at angles of 45°, 22½° and 67½° to it. It should be noted that 22½° is ½ of a right angle, and 67½° is ¾ of a right angle.

To use the graph, determine the approximate direction of the wind with reference to the line of fire.

Note where a circle corresponding to the range cuts the diagonal line most closely approximating to the direction of the wind.

The allowance for direction can then be read off the scale vertically below this point, and for elevation horizontally opposite it.

iv. With reference to ii and iii, above, barometer and temperature readings, and the strength and direction of the wind may be obtained from the "Meteor" wire, which in war is issued by the Meteorological Section at certain periods during the day.

If this is not available, artillery batteries can usually give the information required.

CHAPTER VII

APPLICATION OF FIRE—GENERAL

42. *Basis of fire control rules*

1. In order that the greatest value may be obtained from the important factor of surprise, the target must be hit in the first burst of fire, or as soon as possible after it. Observation of machine-gun fire is only possible on certain types of ground, and, particularly in European countries, can never be relied upon. The opportunity of correcting fire on to the target by observation of strike will therefore seldom occur.

2. There is no quick reliable means of determining the range exactly, nor of estimating with precise accuracy the effect of climatic conditions. Errors, both of direction and of elevation, must therefore be expected.

The procedure is to define round the target an area allowing for reasonable errors of direction and elevation, and to apply fire over the whole of this area.

The rules of fire control contained in the following sections are based on the assumption that insufficient observation of strike will be obtained to deduce the exact position of the beaten zone. Every endeavour, however, must be made to pick up the strike of the bullets and to correct the fire.

43. *Considerations affecting the area which has to be engaged*

1. *Width of area.*

Errors in direction may be caused by :—

- i. Wrong estimation of wind.
- ii. Slight inaccuracies of aim, wear in the mounting, drift, etc.

As these errors may act either way, it will be necessary to engage an additional area on either side of the target. Lateral errors will not normally be great, but it must be remembered that the beaten zone is narrow and does not give much assistance in overcoming them.

The error increases in proportion to the range, and therefore a greater width will require to be engaged at long ranges than at short. The rules for the allowances to be made will be found under the various headings of methods of fire.

2. *Depth of the area.*

i. Errors in elevation may be caused by :—

- (a) Inaccuracy in determining the range.
- (b) Incorrect allowances for climatic variations.

Errors in elevation due to climatic variations, other than wind, are in themselves small, and therefore are not considered further in this section.

ii. In order to form a basis on which to work it is assumed that personnel can be trained to give the range within a maximum permissible error, according to the method employed, as follows:—

	Maximum permissible error
(a) By range-finding instrument ..	5 %
(b) By estimating from a key range (see Sec. 21, 4) ..	10 %
(c) From a map of not less scale than 1/20,000 ..	5 %

The error may have been made either way, *i.e.* the range may have been given too long by the whole amount of the error or too short by the whole amount of the error. Therefore the point to which a range is taken may lie on a line equal to twice the amount of permissible error.

For example:—

The range-taker gives the range to a point target (*i.e.* a target of inconsiderable width) as 1300 yards, obtained by the range-finder.

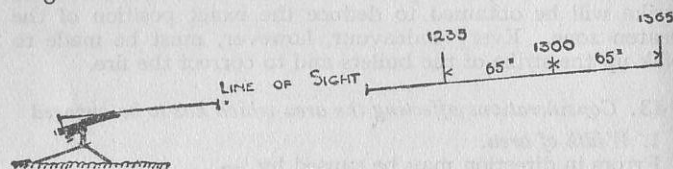


Fig. 14.

The target may be anywhere between 1235 and 1365 yards (see Fig. 14).

To ensure effect, therefore, it would be necessary for the whole of this length (130 yards) to be included in the beaten zone.

44. The combined sight rule

1. For all practical purposes it may be taken that the centre shot of the beaten zone falls along the line of sight at a range corresponding to the tangent elevation on the gun, and that half the beaten zone as given in the Range Table falls beyond this point and half short of it.

For example:—

A gun is firing at a point target at a range of 1300 yards. The beaten zone for 1300 from the Range Table is 210 yards.

Therefore the furthest shot in the effective beaten zone may be taken as falling at 1405 yards, and the nearest at 1195 yards. (See Fig. 15.)

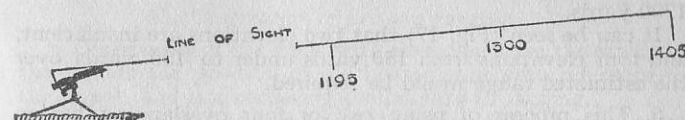


Fig. 15.

2. Now if Fig. 14, in which is shown the total length on which the target may lie for a range of 1300, obtained with the range-finder, is compared with Fig. 15, it can be seen that the length of the beaten zone will cover the permissible error, and fire effect should be obtained at once by giving the same elevation with the same point of aim to the two guns of the fire unit.

3. It will be remembered, however, that up to 2000 yards the length of the beaten zone decreases with the range, whereas the permissible error will increase.

Further, for ranges estimated from key ranges there is a permissible error of 10 per cent. of the range.

Therefore the length of the beaten zone formed by giving both guns the same elevation as above is not always sufficient to overcome range-taking errors.

For example:—

Suppose the range of 1300 has been obtained from a key range.

In this case the permissible error is 130 yards (10 per cent. of the range), and the target may be between 1170 and 1430 (Fig. 16), whereas the beaten zone at 1300 only covers from 1195 to 1405.

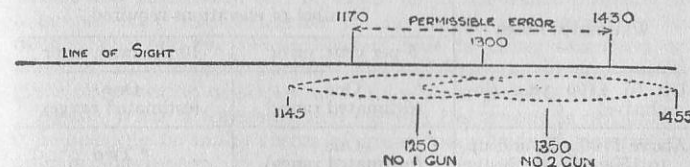


Fig. 16.

If, however, the centres of two beaten zones were separated by 100 yards, the permissible error would be covered. This can be effected by giving one gun an elevation of 50 yards under, and the other gun of 50 yards over the estimated range, both guns using the same point of aim (Fig. 16).

4. At longer ranges, when estimated from a key range, it may be necessary to use more than two elevations.

For example, take a range estimated from a key range as 1700 yards.

It can be seen (Fig. 17) that two elevations are insufficient, and four elevations from 150 yards under to 150 yards over the estimated range would be required.

5. This process of using two or four overlapping beaten zones to compensate for the permissible error in range is termed "using combined sights."

When using combined sights the centres of adjacent beaten zones are always separated by 100 yards. This figure has been chosen as giving a reasonable overlap at all ranges.

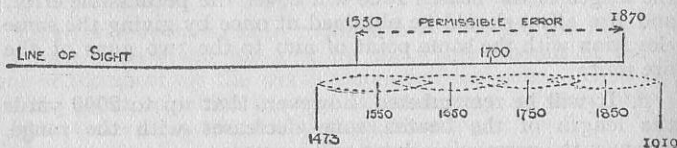


Fig. 17.

6. To determine whether combined sights are necessary, compare the length of the beaten zone in the Range Table with twice the permissible error in range. If the latter is the greater, combined sights are necessary.

In order that it should not be necessary to make this calculation for every range, the table below gives rules showing the number of elevations to be used at different ranges according to the method of obtaining the range.

In a few cases, using ranges estimated from a key range, the rule is approximate only.

Estimated range	Number of elevations required	
	5 per cent. error	10 per cent. error
Up to 1100 yds. (inclusive)	One (estimated range)	One (estimated range)
Above 1100 yds. and up to 1500 yds. (inclusive)	One (estimated range)	* Two
Above 1500 yds.	* Two	† Four

* When two elevations are necessary, use 50 yards under and 50 yards over estimated range.

† When four elevations are necessary, use 50 yards under and 50 yards over the estimated range; 150 yards under and 150 yards over the estimated range.

7. The above rules will only be followed as long as observation of strike has not been obtained.

45. Observation of fire and ranging

1. *Observation of fire* deals with deducing from the strike of the bullets the position of the beaten zone with reference to the target, and is a necessary preliminary to ranging.

Ranging is the process of determining by observation of fire the direction and elevation necessary to hit a given target.

2. Observation of fire.

i. The possibility of observation of strike will depend on a variety of factors in addition to the distance of the observer from the target, of which the following are the most important:—

- The nature of the soil round the target. Sand, plough and water generally give good results, but damp ground, long grass and undergrowth are bad.
- Visibility as affected by light, mist or mirage.
- The position of the sun. When low in the horizon strike is easier to pick up than when it is high.
- Wind. A high wind tends to blow away the dust caused by the strike before it can be observed.

The action of the enemy will often be a clue as to whether fire effect is being obtained, *e.g.* cessation of hostile fire, etc.

In war, the fall of shell and the strike of bullets from other machine guns near the target will interfere with accurate observation.

ii. It is a fundamental principle in observation of fire only to accept information which is definite or certain, and not to act on what is uncertain or no more than probable. Thus, before any deduction can be made as to the exact position of a beaten zone with reference to the target, it is necessary to decide whether the whole beaten zone is being observed or whether only a small portion of it is falling on ground which gives observation of strike, and if so, what portion of it.

Again, when a foreshortened view of the ground is obtained, it is possible to make errors of great magnitude if guesswork only is relied upon.

iii. In the engagement of targets with width or depth the beaten zones of the guns of the fire unit are distributed over the target according to the method of fire employed. It cannot therefore be assumed that full fire effect has been obtained until the position of each individual beaten zone is found and checked.

iv. Tracer ammunition is of value for determining correct-

ness of line. Considerable practice is necessary to judge from it the actual strike of the bullet, even if the tracer composition is still burning when the bullets hit the ground.

v. It must be remembered that it is necessary to observe the area in which the beaten zone is to fall, rather than the ground in the immediate vicinity of the definite aiming mark.

vi. It may occur that an area of ground adjacent to the target is specially suitable for observation. Under these circumstances it may be profitable to direct the fire on to this area in the first instance, correcting it on to the target as soon as observation has been obtained.

vii. Bursts of fire must be long enough to enable the beaten zone to be "found," as well as to produce the required fire effect on the target.

The following lengths of bursts are laid down as a guide, and should be known to all firers:—

Yards				Rounds
Up to 1100	..	..	..	10-20
1100-1500	..	..	..	20-30
Over 1500	..	..	..	30-50

3. Ranging.

i. Ranging may be carried out:—

(a) To correct fire on to a target as soon as the data obtained by observation warrants it.

(b) To register the direction and elevation required to hit a target after fire effect has been obtained.

ii. It is required to bring the centres of the beaten zones on to their correct positions on the target as soon as possible after the first burst. This may entail corrections for elevation or direction or for both.

iii. The general principles to be followed are:—

(a) Only correct when it is certain that full fire effect is not being obtained.

(b) When making corrections, unless the correction required can be determined accurately, over-estimate it rather than under-estimate it, always provided the safety of our own troops is not involved.

iv. Corrections for line.

Observation of machine-gun fire is normally carried out from a position near the guns. In this case it is possible to measure the exact correction required, either with graticuled glasses or by hand angles.

v. Corrections for elevation.

(a) It is not possible to determine the exact amount by which the beaten zone is falling over or short of the target.

The length of the beaten zone being known, if the whole of it is seen it will give a useful guide as to the amount of correction to give, *e.g.* it might be estimated that the distance between the beaten zone and the target is either once or twice the beaten zone as seen on the ground.

(b) It should be remembered that where a foreshortened view of the ground is obtained, the tendency will be to under-estimate the correction required.

As a rule, therefore, bold corrections should be given, particularly where there is no guide to amount required.

The object is to include the target in a bracket rather than to creep towards it by inadequate corrections.

The actual manner in which corrections are given and acted upon will be found in Secs. 70 and 71.

vi. When fire is being observed from a flank, the fact that the bullets appear to be falling behind or in front of the target as viewed from the observation post will give definite indications as to whether a right or left correction is required.

Again, bullets which are falling on the correct line gun-target will appear from the observation post to be right or left of it.

In these circumstances, to ascertain the actual position of the bullets with reference to the target, it is necessary to visualize the line gun-target on the ground and judge accordingly.

4. Observation of fire and ranging are normally carried out by the fire controller. In heavy fighting, owing to casualties and other reasons, unit control may break down, and control by the firer will become necessary. Except in very favourable circumstances, little reliance can be placed on observation by the firer at ranges over 800 yards. The training in ranging therefore is confined to ranges of 1000 yards and under, using the naked eye. Officers, N.C.Os. and range-takers only are trained at longer distances. (See Sec. 16.)

46. Direct and indirect fire

1. As already stated, the normal method of engaging a target will be by direct fire, *i.e.* by laying on the target over the sights. The main asset of direct fire is its extreme flexibility, which enables a succession of targets over a wide arc to be engaged with facility.

Where flexibility is not essential, *e.g.* for the engagement of a limited number of well-defined targets in support of an

attack, many definite tactical advantages accrue to indirect fire, since the position is not in view of the enemy.

The main occasions on which indirect fire is or might be employed may be summarized as under :—

- i. When it is impossible, or inadvisable, to occupy a direct fire position.
- ii. In darkness, mist or smoke.
- iii. When guns placed in depth, in direct fire positions for primary tasks, can only fire in front of the foremost troops by this means.
- iv. When only exposed positions are available and it is desired to place some guns in positions from which they can be easily withdrawn.

2. The technical disadvantages of direct fire are the personal error of the No. 1 in laying, the difficulties of indicating and picking up targets, and those due to light, dust and bursting shells.

The main technical advantage of indirect fire is that the necessity for pointing out the target to a number of individuals is removed and speed and accuracy thereby gained. In addition, the laying is mechanical, and its accuracy is not affected by light or distance. The disadvantages are the necessity for the measurement or calculation of the angle of sight, and the difficulties of crest clearance due to the flat trajectory.

3. Conditions which obstruct the field of view (*e.g.* bad visibility, fog, smoke screens, the smoke and dust of artillery fire, etc.) often arise after a position is occupied. Consequently, when direct fire is to be employed, certain arrangements as for indirect fire should be made as soon as time permits.

The detail of these arrangements will be found in Section drill—Direct fire (Sec. 26, 6) and in Sec. 61.

4. The principles and details of fire control set down in this chapter apply to both direct and indirect fire. As the methods of fire and details of fire discipline are in many cases not the same, direct and indirect fire are treated separately in the remainder of this part.

CHAPTER VIII

APPLICATION OF FIRE—DIRECT

(NOTE.—The fire unit when firing direct is the section.)

47. General remarks

1. The following is the procedure for engaging a target by a direct fire unit. The fire controller, by means of a fire order, gives an elevation and indicates a point of aim on the target for each gun. Each firer sets his backsight at the elevation ordered, and by tapping the gun and the use of the elevating handwheel directs the line of sight on to the point indicated for his gun. Thus the gun is laid initially for both elevation and direction.

In order that the target may be engaged with the maximum fire effect, the form of the fire order will indicate a method of fire. The method of fire ordered will depend on :—

- i. The range, and the manner in which it has been obtained *i.e.* whether it is necessary to combine sights or not.
- ii. The shape of the target and its position with reference to the guns.
- iii. The nature of the target. For example, when the whole target cannot be engaged simultaneously, the method of fire chosen must be such as will give the best tactical result.

48. Methods of fire

1. Methods of fire applying to direction are :—

Traversing right and left.
Traversing.
Inwards traversing.
Swinging traverse.

The term "*traversing*," in addition to defining a particular method of fire, is used to denote at any time the process of engaging a required width by applying successive and overlapping beaten zones laterally across it.

The firer is taught the required strength of tap to displace the line of sight by 15', this being an amount which it is calculated will cause successive beaten zones to overlap slightly at all ranges. This tap is called "the regulation 15' tap."

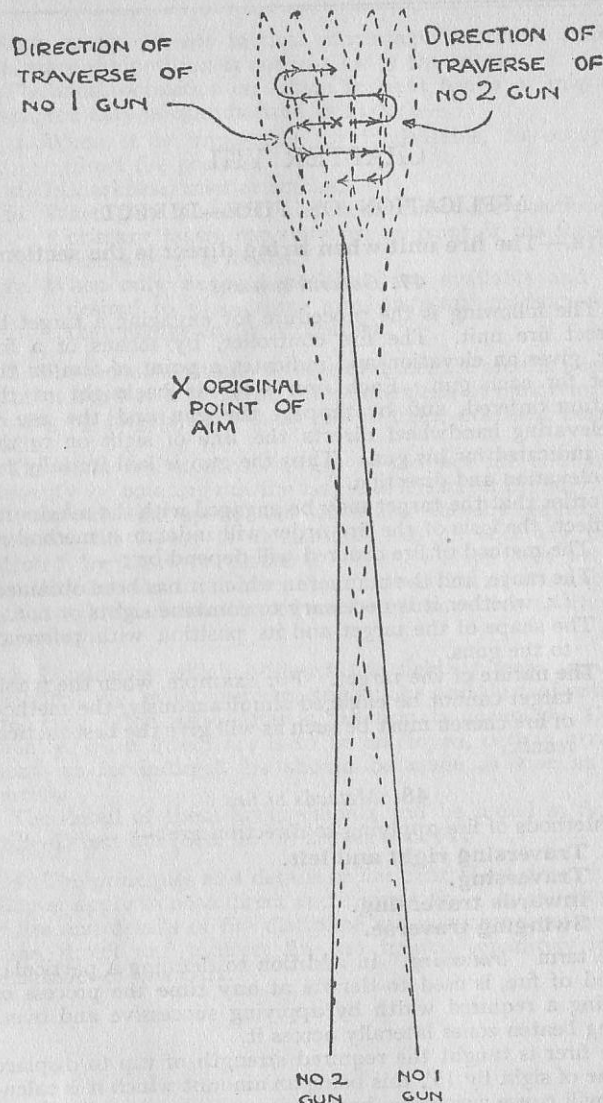


Fig. 18.—Traversing Right and Left—2 Taps

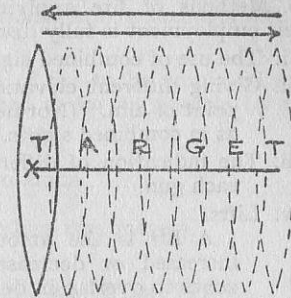
2. *Traversing right and left.*

Both guns have the same point of aim, and are traversed right and left of the target by the number of taps ordered. A burst is fired between each tap. (See Fig. 18.)

3. *Traversing.*

Both guns have the same point of aim, normally the left end of the target. The guns, using the regulation 15' tap, are traversed to the right, firing a burst between each tap, across the whole width of the target and back, until ordered to stop. (Fig. 19.)

If it is desired that traversing should be carried out from the right end of the target, an order to this effect is given.



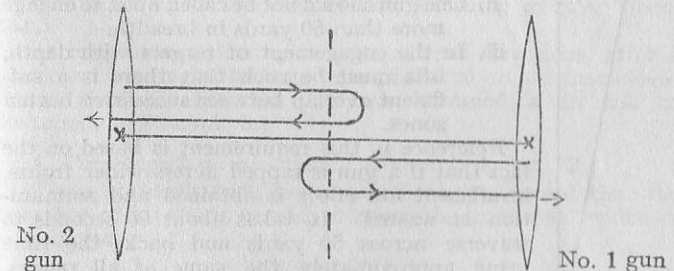
X Original point of aim, zones of one gun only shown

Fig. 19.

Traversing

4. *Inwards traversing.*

A gun is laid on each end of the target. Each traverses inwards slightly more than half the target, and back. (Fig. 20.)



XX Original points of aim

Fig. 20.

Inwards Traversing

5. *Swinging traverse.*

This is a special method of fire in which the gun is not

traversed by tapping, but by loosening the traversing clamp and swinging the gun across the target.

It is taught in Elementary gun drill, and a full description will be found in Sec. 24, 18.

6. Methods of fire applying to elevation are as under. Their employment is fully discussed in the following section.

- i. The use of combined sights. (Sec. 44.)
- ii. Giving different elevations to each gun with the same point of aim. (Not necessarily differing by 100 yards, as in combined sights.)
- iii. The indication of different points of aim in depth for each gun.
- iv. Lifts.

A lift is the amount by which the elevation is increased or decreased to cause successive beaten zones to overlap in depth.

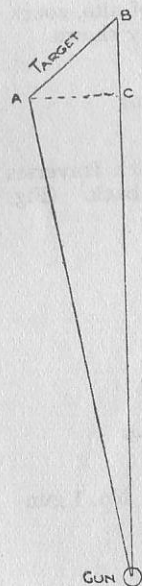


Fig. 21.

49. Engagement of targets—Direct.

NOTE.—The examples referred to in this chapter will be found in Sec. 72.

1. The main principles to be borne in mind in the engagement of targets are :—
 - i. The whole area in which the target may lie must be covered with fire as early as possible. (See Sec. 43.)
 - ii. One gun should not be called upon to engage more than 50 yards in breadth.
 - iii. In the engagement of targets with depth, lifts must be such that there is a sufficient overlap between successive beaten zones.

Reference ii, this requirement is based on the fact that if a gun is tapped across wider fronts, insufficient fire effect is obtained and ammunition is wasted. It takes about 90 seconds to traverse across 50 yards and back, the time being approximately the same at all ranges, because, although the angular amount to be traversed decreases with the range, the length of burst required increases. The rule is given as a guide ; some small latitude can be taken in its application.

The width of the target can be obtained either by judging distance laterally or by measuring the angular

width with gratitudes and determining the amount this angle subtends at the range.

It should be noted that it is the *angular width* subtended at the guns, and not the actual length of the target, which is considered in this and similar machine-gun calculations, e.g. in Fig. 21 the distance to be taken into account is AC and not AB.

2. In order that the method of fire to be employed for a particular target can be governed as far as possible by rule, targets are classified as :—

Point targets.

Targets with width (not oblique).

Oblique targets.

Targets with depth, including area targets.

Moving targets.

3. Point targets. (Examples 1, 2 and 3, Sec. 72.)

Up to 1100 yards, errors in direction will be small, and therefore should be covered by the width of the beaten zone. Over this range it will be necessary to traverse right and left of the target.

The rule is :—

Above 1100 yards, Traverse R and L 1 tap.

Above 1500 yards, Traverse R and L 2 taps.

If the point of aim is indefinite, an extra tap R and L should be given.

Combined sights are used or not according to rule. (Sec. 44.)

At ranges necessitating the use of four elevations, after a sufficient volume of fire has been produced on the first elevations, if observation has not been obtained, a lift will be required. (Example 3.)

4. Targets with a little width. (Example 4, Sec. 72.)

These are dealt with as for point targets, except that the number of taps is increased to cover the additional width of the target.

For example :—

Target is measured as 30' and range is given as 1300. Both guns are laid on the centre of the target. Each gun will therefore require one tap R and L to cover width of target and one tap to cover unaccountable errors.

As a guide, it may be taken that if the number of taps R and L to be given exceeds three, the target should be treated as a broad target.

on these elevations, the lower elevation is decreased and the higher increased by 100 yards, and traversing is continued as before.

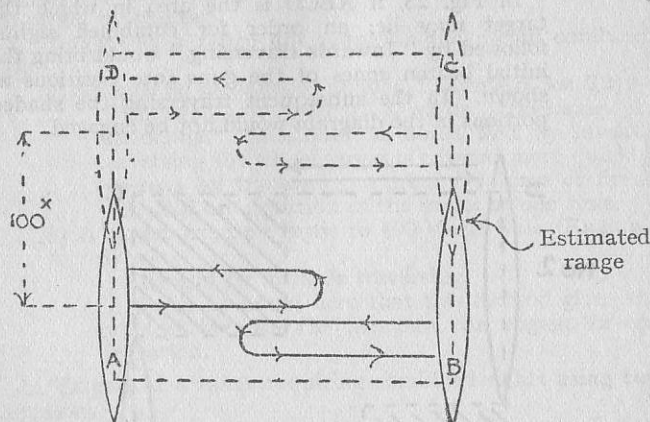


Fig. 24.

6. Oblique targets.

- i. Those which have the same range to each end, but a different angle of sight.

These are engaged by inwards traversing or traversing, according to the width of the target. The firer relays his gun on to the target after each tap by means of the elevating handwheel. This is known as oblique traversing, and is taught in Elementary gun drill (Sec. 24, 17).

- ii. Targets the ends of which are at a different range, but with the same angle of sight (Examples 9 and 10, Sec. 72) :—

Engaged by traversing with or without combined sights, or inwards traversing. In the last case it should be noted that different initial elevations are required; if the range calls for combined sights, it will be necessary to commence with the lower elevations required and lift 100 yards.

7. Targets with depth.

- i. Deep targets can be engaged by applying overlapping beaten zones in depth, or by searching back in lifts from the front edge.

The method chosen will depend on the nature of the target. The near edge is generally the more important. In this case searching back will be the best procedure to employ, as the fire can be applied along the target on as wide a front as

possible. It should be remembered that by this method surprise effect is apt to be lost.

- ii. Targets along or nearly along the line of sight (Examples 11, 13 and 14, Sec. 72) :—

A target of little width may be engaged by giving different elevations to each gun and the same point of aim, the difference in elevations to be such as to cover as much of the target as possible and yet give sufficient overlap between beaten zones. It is always safe to give a difference in elevation of 100 yards.

The target will be traversed right and left in accordance with para. 4, above.

If the target has more width than can be dealt with by this method, the rules in para. 5, above, should be applied.

- iii. Targets with depth on a forward slope (Example 12, Sec. 72) :—

In the engagement of targets of this type, where the angle of sight increases from front to rear of the target, it must be remembered that when a lift is given it will also generally be necessary to order a fresh point of aim.

8. Moving targets (Example 15, Sec. 72) :—

- i. *Methods of engagement.*

There are three methods of engaging moving targets :—

- (a) Traversing in front : suitable at ranges over 800 yards for engaging a slow moving target.
- (b) Engaging an area through which the target is likely to pass. This is suitable for fleeting targets, such as infantry making use of ground, cavalry and armoured fighting vehicles.

It is carried out by :—

Including such areas within the arcs allotted during the preliminary arrangements of the fire plan.

Giving an anticipatory fire order based on quick estimation of the direction and speed of a rapidly moving target such as an armoured fighting vehicle.

- (c) The swinging traverse, suitable against moving targets at close range, when other methods would be too slow.

- ii. *Fire control.*

- (a) Fire orders must be simple and as short as possible, otherwise the opportunity of engaging the target may be lost.

- (b) The fire unit commander will maintain control until, owing to the closeness of the range or other factors, greater fire effect may be expected from gun control. He must change to gun control before unit fire control breaks down.
- (c) When engaging a moving target, whether by section or gun control, attention must be continually directed to:—

The changing line of sight, horizontally and vertically.

The alterations in range.

The maximum effect will only be obtained by quick judgment and a thorough knowledge of the machine-gun beaten zones.

Fire should be directed in front of the target rather than on to it.

- (d) Armour-piercing ammunition, if available, will be reserved for use at those ranges when its armour-piercing qualities are effective.

iii. Allowances for moving targets.

This table is constructed on the assumption that it will take one minute from the commencement of the fire order to lay the guns.

Target and speed in m.p.h.	Distance travelled in yards in one minute	Approx. angular distance target will travel during flight of bullet for ranges between 800 and 2000 yards.*	
		If at right angles to the guns	If obliquely to the guns
3	90	15'	15'
6	175	30'	15'
9	260	45'	30'
12	370	1° 0'	30'
15	440	1° 15'	45'
18	530	1° 30'	45'

iv. Modifications applicable to fast-moving targets such as armoured fighting vehicles.

Bearing in mind the limited time that an armoured fighting vehicle will take to pass through the beaten zones, a burst of fire should be of 50-60 rounds, in order to ensure the maximum weight of fire during this period.

* Below 800 yards, an allowance of 15' or 30', depending on the range, will be sufficient.

CHAPTER IX

APPLICATION OF FIRE—INDIRECT

50. General remarks

1. The opening of fire rapidly and effectively by indirect means depends on accuracy in the use of the various instruments and minute precision in drill. This can only be attained by a high standard of training and frequent practice.

2. The principles and methods laid down in the following sections apply to any number of machine guns that may be grouped together as a fire unit under one fire controller.

The platoon, being the normal indirect fire unit, is referred to throughout for reasons of brevity and simplicity.

It must be realized that the diagrams are not drawn to scale.

51. General principles

1. The methods of laying guns by indirect means consist of giving direction to the guns by laying them off a point seen

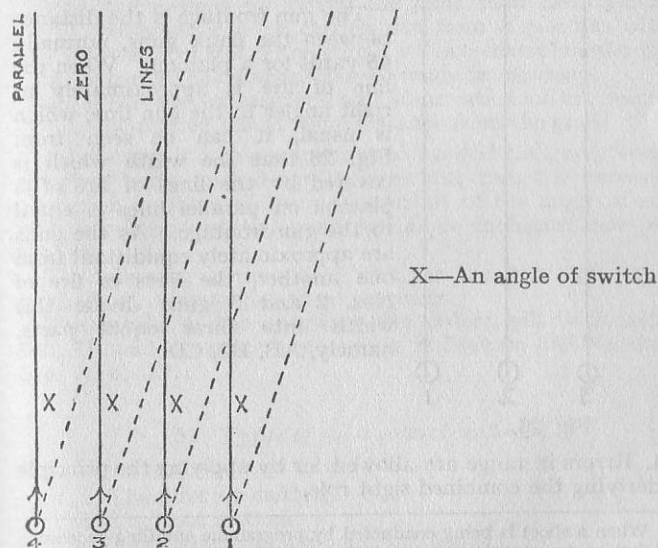


Fig. 25.

from the gun positions. Elevation is calculated from the horizontal plane, and is placed on the gun by means of the clinometer. Both direction and elevation are maintained by means of an aiming mark, usually an aiming post placed in front of the guns.

2. Zero lines.

Lines which are parallel, when swung through the same angle, remain parallel.

Therefore, to provide a basis from which fire can be switched in any direction, all guns are, by various means, initially placed on parallel zero lines. (See Fig. 25.)

The choice of the actual direction of the zero lines is arbitrary, but they are generally laid out so that the line of fire of one of the guns will fall on its correct position on the first target, either directly or after an angle of switch has been given.* This gun is known as the pivot gun, and is usually one or other of the flank guns.

3. Gun frontage.

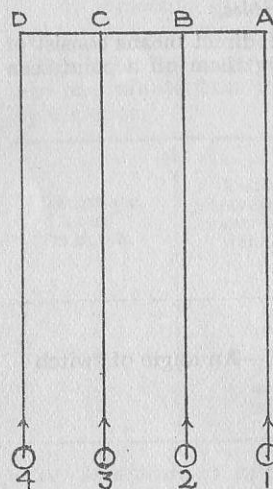


Fig. 26.

The gun frontage is the distance between the flank guns, normally 45 yards for a platoon. When the line of fire is approximately at right angles to the gun line, which is usual, it can be seen from Fig. 26 that the width which is covered by the lines of fire of a platoon on parallel lines is equal to the gun frontage. As the guns are approximately equidistant from one another, the lines of fire of Nos. 2 and 3 guns divide this width into three equal parts, namely, AB, BC, CD.

4. Errors in range are allowed for by applying the principle underlying the combined sight rule.

* When a shoot is being conducted by programme entailing successive switches on to several targets, the zero line chosen should be such that the greatest number of targets can be engaged on the bar foresight.

To allow for errors in direction, lines of fire will not normally be concentrated inside the width covered by parallel lines of fire, even for the engagement of a point target, unless observation is obtained. Therefore, in the engagement of point targets, and targets of lesser width than the gun frontage, arrangements are made to bring the target centrally between the parallel lines of fire of the flank guns. The gaps between the guns are covered by traversing right and left one tap, this being sufficient to cause the beaten zones to overlap laterally at all ranges. It will be noted that additional width is covered in that the flank guns traverse outside the gun frontage by one tap.

When the target is of greater width than the gun frontage, guns are first placed on parallel lines with the pivot gun on its own portion of the target. Lines of fire are then either opened out, the gaps between them being filled by traversing right and left, or kept parallel and switched from one portion of the target to another.

5. The various methods employed for the engagement of targets by indirect means may be classified as under :—

- i. Methods employed when the control of fire and the calculations for giving the guns their elevation and direction can be carried out from a position within voice control of the guns. (Voice-control methods.)
- ii. When all calculations can be made from a map.
- iii. When the calculations and observation of fire have to be carried out at some distance from the guns.

In all cases it is necessary first to parallel the guns, lines of fire then being opened out to cover the target if necessary. Elevation is obtained by measurement of the angle of sight and calculation of the quadrant angle in accordance with Sec. 40, 1, ii.

The following sections deal with the theory of the various methods of carrying out these processes.

The details of the necessary fire orders will be found in Sec. 71, and the procedure is given in Platoon drill—Indirect fire. (Sec. 27.)

52. Types of voice control methods

1. Voice control methods are :—

- i. The director method.
- ii. The post method.
- iii. The distant aiming-point method.
- iv. The crest method.

These methods only differ in the manner in which the guns are placed on their zero lines; this is dealt with in the following sections. Details in regard to distribution and elevation, as applied to all the voice-control methods, are dealt with in Secs. 57 and 58.

53. The director method

1. The director can be employed to parallel the guns when a position can be found for it, either in front of or behind the gun line, from which both the target and the guns can be seen. This position should not be closer than 50 yards to the guns, nor more distant than approximately 150 yards.

There are two cases :—

- i. When the director can be set up so that its position comes between the zero lines of the flank guns, or nearly so.
- ii. When the director has to be placed to one flank or the other of the gun line.

2. The director is used to place the guns on lines parallel to that on which it is itself laid. Therefore the point on the target on which it lays initially will depend on the position of the instrument with reference to the gun line.

For example, consider a target of the same width as the gun frontage. (Sec. 51, 3.)

It is required to bring the line of No. 1 gun on to the right flank of the target (T_1 , Fig. 27), and the remaining guns on parallel lines. Suppose the director is in position at O_1 .

In order that the zero line of No. 1 gun G_1T_1 should fall on the right flank of the target when placed parallel to the initial line of the director sight, it will be necessary for the director to be laid as much to the left of T_1 as its position is left of No. 1 gun, that is at X_1 .

Similarly, if the director were at O_2 in the centre of the gun line, it must be laid at X_2 in the centre of the target.

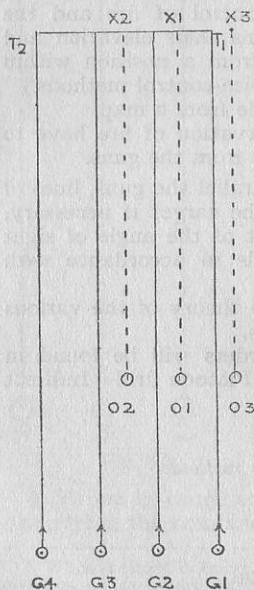


Fig. 27.

If it were at O_3 outside the gun line, it must be laid at X_3 .

3. In practice, the position at which the director is set up will depend on the type of target. For targets with width equal to, or greater than, the gun frontage, a position as near as possible to the required zero line of one of the flank guns is most suitable. For point targets or targets of little width a central position will give the best results.

4. Procedure.

i. Set up the director in front of or behind the gun line with the arrow on the index plate set at 180° on the degree scale plate, and the index plate clamp tightened.

ii. Loosen the clamping screw of the clamping socket and lay the telescope on the selected point of aim on the target. Tighten the clamping screw.

iii. Release the index plate clamp and lay on the centre of the socket of each gun in turn. (The guns will have previously been ordered to lay on the director with their dials at zero.)

Read the angle for each gun off the degree scale and give it out to the guns concerned.

Each gun swings off the director through the angle ordered. Guns will then be on lines parallel to the initial line on which the director was laid.

5. Theory.

Reference Fig. 28 (p. 158), X is the point of aim on the target selected for the director.

OOG_1 is the line joining the director and No. 1 gun.

It is desired to place G_1T_1 parallel to OX .

If the angle T_1G_1O is made equal to XOQ , G_1T_1 will be parallel to OX .

The position of the telescope when the arrow on the index plate is set at 180° and the telescope laid on the target is shown at O in black. When the telescope is swung round and laid on the gun, it will be in the dotted position and the arrow on the index plate will have moved round from 180° to a position P on the degree scale plate. As the scale on the degree scale plate runs from 0° through $90^\circ R$ to 180° as shown in the diagram, it can be seen that the reading opposite P will be that for the angle XOQ . The gun is then swung off the director through this angle, which will bring it on to the point T_1 where G_1T_1 is parallel to OX .

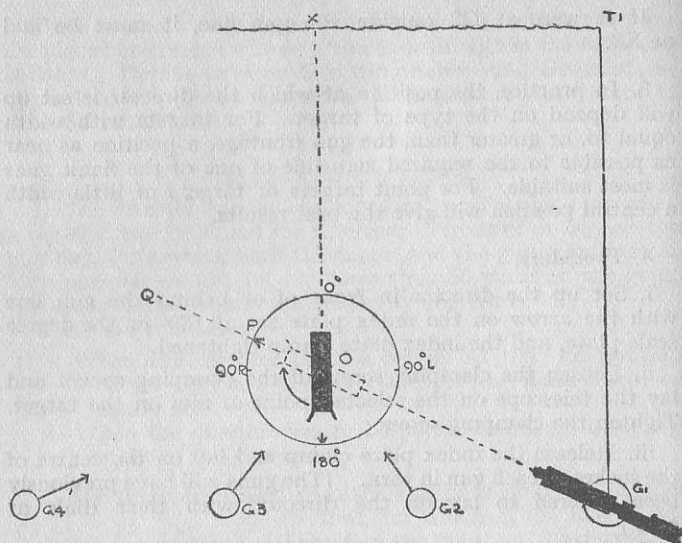


Fig. 28.

6. It may often occur that a convenient position for the director cannot be found within the zero lines for the flank guns. In this case, provided that the director can be placed within 30 yards on either flank of the gun line, the amount that its position is right or left of the zero line for the flank gun can be judged, and the director laid off that amount from the flank of the target. It is not considered possible to judge greater amounts than 30 yards with sufficient accuracy. If the position of the director has to be outside these limits, a corrected angle must be given out to each gun. The method is described in the following paragraph. It is suitable for a position of the director up to any distance from the guns, provided that voice control can be exercised. This will normally limit the position of the director to within about 150 yards from the gun line.

7. Procedure.

O is the position of the director. (Fig. 29.)

G_1 the pivot gun.

T_1 the correct position on the target for the pivot gun.

(a) Pace G_1O .

(b) With the director measure T_1OG_1 .

(c) Turn to the conversion scale facing page 8, Range

Table. Mark the angle corresponding to T_1OG_1 on the bottom scale. Where the director is in front of the gun line, this angle will be between 90° and 180° , and the top line of *degree* readings is used from left to right. Where the director is behind the gun line, T_1OG_1 will be between 0° and 90° , and the bottom line of *degree* readings is used from right to left.

Note on the top scale the figure opposite the reading for T_1OG_1 on the bottom scale.

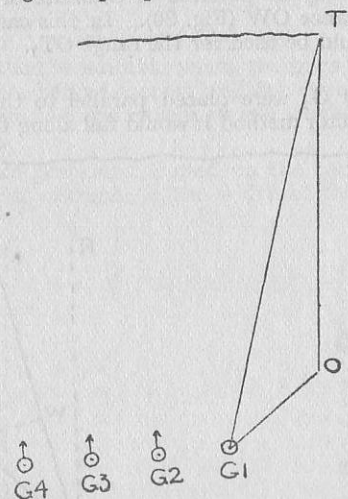


Fig. 29.

(d) Multiply G_1O by this figure and divide the product by 100. This gives what is known as the "true base."

(e) Turn to the displacement table below the conversion scale. Opposite the true base and under the gun range will be found an angle.

If the director is on the right of the gun line, set this angle on the "L" scale of the degree scale plate, and *vice versa*. Then lay on each gun in turn and give out angles as in director method described above.

ii. Example.

Director on left of guns.

G_1O paced as 85 yards.

T_1OG_1 measured as 143° .

Gun range = 1800 yards.

Percentage given from conversion scale above $143^\circ = 60$.

Therefore true base = $\frac{60 \times 85}{100} = 51$ yards.

iii. From displacement table, angle at which director is to be set = $178^\circ 20' R$.

iv. It may be feasible to estimate or pace the true base G_1Y (Fig. 30). In this case it would be unnecessary to measure T_1OG_1 , and time would be saved.

Similarly, it may be possible to estimate or pace the perpendicular distance OW (Fig. 30). In this case the displacement table should be used for the range OT_1 .

v. Theory.

If the line of G_1 were placed parallel to the line OT_1 by the normal director method it would fall along G_1R . In order

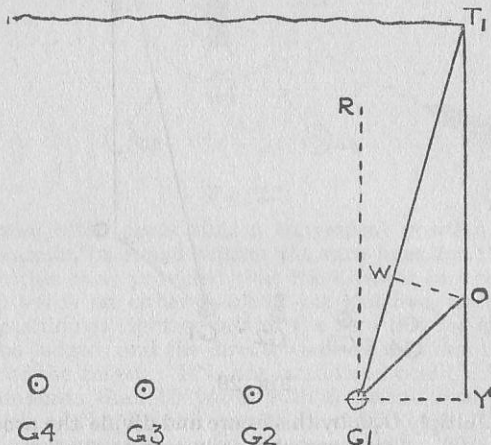


Fig. 30.

that it may be directed at T_1 , it would have to swing through the angle RG_1T_1 .

G_1R and OT_1 being parallel, the angle RG_1T_1 is equal to G_1T_1O .

If, therefore, we determine the angle G_1T_1O and deduct it from the angle read for No. 1, using the normal director method, when No. 1 swings off the director by the resulting angle its line will fall on T_1 .

To bring the other guns on parallel lines the angle G_1T_1O must be deducted from the angle read for each in the normal manner.

The problem therefore resolves itself into the finding of the angle G_1T_1O .

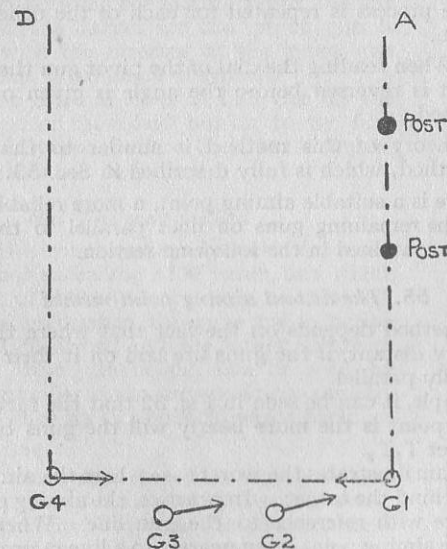
If G_1Y is drawn at right angles to T_1O produced, it can be seen that the angle G_1T_1O subtends G_1Y at gun range. Therefore, if we know G_1Y , the V.I. graph will give us G_1T_1O . In the procedure described, the conversion scale gives the percentage G_1Y is of G_1O , and the displacement table automatically deducts from 180° the amount subtended by G_1Y at the gun range.

54. The post method

1. This method is suitable when the guns can be brought into action close behind a crest, and the use of the director to parallel the guns is inconvenient or inadvisable.

2. Procedure.

Two or more posts are aligned on the correct line for the pivot gun. For example, if the width of the target is equal



(Guns shown "staggered")

Fig. 31.

to the gun frontage, and No. 1 is to be the pivot gun, the posts will be aligned on the right flank of the target. They

will be placed so that the line joining them passes over the approximate position chosen for that gun. (Fig. 31.)

Both posts, or any two, if more than two have been used, must be visible from this position at gun height. When the guns are brought up the pivot gun is mounted in direct alignment with the posts, and the gun is laid on them. It will then be on its zero line.

The remaining guns are "staggered" so that they have an uninterrupted view of the pivot gun, and can be placed on parallel lines to the pivot gun, as follows:—

- i. The dial of the pivot gun is set at 180° .
- ii. The remaining guns lay on the centre of the socket of the pivot gun, and set their dials at zero.
- iii. The pivot gun is laid on the centre of the socket of the gun furthest from it. The angle against the pointer on the dial is read off and given out to the gun concerned. The latter is swung through this angle and is then on a zero line parallel to that of the pivot gun. The process is repeated for each of the other guns in turn.

NOTE.—When reading the dial of the pivot gun the direction right or left is reversed before the angle is given out to the gun concerned.

3. The theory of this method is similar to that for the director method, which is fully described in Sec. 53.

4. If there is a suitable aiming point, a more reliable method of placing the remaining guns on lines parallel to that of the pivot gun is contained in the following section.

55. The distant aiming point method

1. The method depends on the fact that where the aiming point is very distant, if the guns are laid on it their lines will be practically parallel.

For example, it can be seen in Fig. 32 that the further away the aiming point is the more nearly will the guns be parallel on the target T_1T_2 .

The diagram illustrates the worst case where the aiming point is exactly behind the target. In practice, the aiming point may be anywhere with reference to the gun line. When there is a choice, the aiming point lying nearest to a line in prolongation of the gun line will give the best results.

2. For this method to be effective certain conditions must be fulfilled:—

- i. (a) When the aiming point is in prolongation of the gun line it may be as close as 1000 yards.

(b) When the line joining the aiming point to the gun line is at an angle of not more than about half a right angle to the gun line, or the gun line produced, the aiming point may be as close as 4000 yards.

(c) When the line joining the aiming point to the gun line is at a greater angle than this to the gun line, the aiming point should be about 7000 yards distant.

ii. The angle of switch between the aiming point and the target must be measured from a position close to the guns.

3. Procedure.

The guns are laid on the aiming point with their dials at zero. They can then be taken as being on parallel lines.

The angle between the aiming point and the position on the target for the pivot gun is measured with the director or the pivot gun and given out as an angle of switch.

Either the original lines as laid out on the aiming point or those laid out on to the first target can be taken as zero lines, according to which are the most suitable.

56. The crest method

1. This is a rough and ready method for use at ranges not exceeding 1500 yards, and where observation of strike will probably be obtained.

It can be used when the guns are in action just behind the crest, and the target, although not visible from gun height, can be seen by the fire controller from any position directly behind the guns up to about 25 yards back.

2. Procedure.

The fire controller stands or kneels behind each gun in turn at a convenient distance away. He orders the No. 1 to raise the tangent sight and to lean aside. He then orders him to tap the gun right or left until it is laid on to its correct position on the target. For accuracy it is essential that the fire controller should be able to see the tangent sight and foresight clearly.

AIMING
POINT

T_2 T_1
0000
4321

Fig. 32.

the same way as for distribution, except that the lines of fire are closed in instead of being opened out.

For point targets the angle of concentration will be the angular width of the gun frontage at the range gun to target divided by the number of gun intervals.

6. It can be seen from Fig. 34 that when the lines of fire have been opened out only four points, T_1 , B, C and T_2 are struck by the beaten zones. It is necessary, therefore, to traverse Right and Left so that the intervening spaces are engaged.

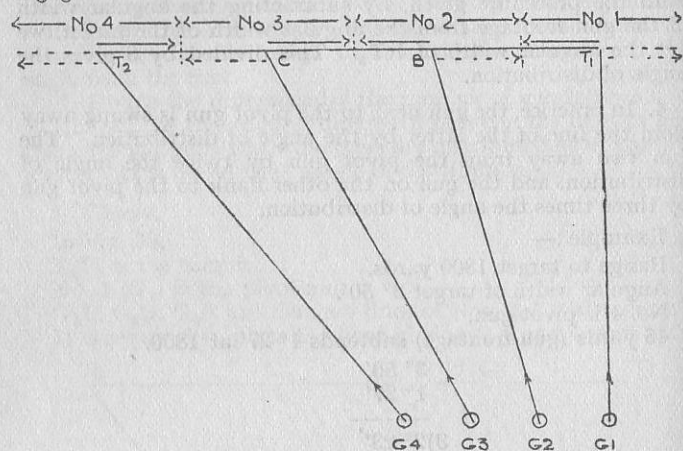


Fig 34.

Each gun must traverse right and left half one of the intervening spaces in order to cover the target. As these spaces are $\frac{1}{3}$ rd of the target frontage, the rule for determining the amount of traverse right and left is to divide the total angular frontage of the target by six. As already stated, the flank guns traverse outside the flanks of the target to allow for errors in direction.

The total width which can be engaged is governed by the rule that no gun must traverse more than 50 yards. The limit of the distance T_1T_2 is therefore 150 yards.

58. Elevation

1. In the voice-control methods the quadrant angle is obtained by one of the processes given below :—

- i. When the angle of sight to the target can be taken from

a position which is within 6 ft. in height of the gun line, and which is not more than 150 yards distant from it.

Measure the angle of sight to the target by means of the director. For all practical purposes this can be taken as being the angle of sight from the gun line.

Correct the range given by the range-taker by the amount his instrument was in front of, or behind, the guns.

Look up the tangent angle for the range in the Range Table and calculate the Q.A. from the formula $Q.A. = T.A. \pm \text{angle of sight}$.

- ii. When the angle of sight to the target cannot be taken from a position within 6 feet in height of the gun line.

One of the following methods may be employed. Both entail measuring the angles of sight from the observation post to the target and to the gun line.

- (a) Using the range O.P. to target and the angle of sight to the target, obtain from the V.I. graph the height the target is above or below the O.P.

Obtain the distance O.P.-gun line by pacing, estimation or range-taker, and, using the angle of sight to the gun line, obtain from the V.I. graph the height the gun line is below or above the O.P.

A comparison of the heights of the gun line and target above or below the O.P. will give the height the target is above or below the gun line.

The Q.A. can then be determined from the Q.A. graph as described in Sec. 41, 8.

Example :—

Angle of sight from O.P. to target—Depression 25'.

Angle of sight from O.P. to gun line—Depression 2° 20'.

Range O.P.-target, 1700 yards.

Distance O.P.-gun line, 80 yards.

Range gun line-target (estimated) 1750 yards.

Target is below O.P.—11 yards. (The amount subtended by 25' at 1700 yards.)

Gun line is below O.P.—3 yards. (The amount subtended by 2° 20' at 80 yards.)

Therefore target is below gun line 8 yards.

From Q.A. graph, Q.A. required = Elevation 1° 55'.

- (b) Obtain the angle of sight gun line-target from the following formula and calculate the Q.A. as in sub-para. i, above :—

$$\left. \begin{array}{l} \text{Angle of sight from} \\ \text{gun position in} \\ \text{minutes.} \end{array} \right\} = \frac{(a_1 \times GO) + (a_2 \times OT)}{GT}$$

Where T is the target, O the position of the director and G the gun line, and where

a_1 is the angle of sight from G to O in minutes
 a_2 " " " " O to T "

a_1 and a_2 must be provided with the correct signs before being placed in the formula, *i.e.* plus for angles of elevation, minus for angles of depression.

Example :—

Angles of sight are measured by director.

To target—Depression 5'.

To pivot gun—Depression 3°.

The angle of sight from G to O is opposite in sign to that from O to G, and is therefore elevation 3°.

OT = 1900 yards, OG = 150 yards, GT = 2000 yards.

The required angle of sight in minutes

$$= \frac{180 \times 150 + (-5 \times 1900)}{2000}$$

$$= \frac{18 \times 15 - 5 \times 19}{20}$$

$$= \frac{270 - 95}{20} = + \frac{175}{20} = \text{approx. } 9' \text{ elevation.}$$

T.A. for 2000 = 4° 16'

Angle of sight = 9' elevation.

Q.A. = 4° 25' elevation.

2. The target may have a different range to each end, and possibly also a different angle of sight. In this case the quadrant angle must be calculated for each end of the target, which will give the Q.As. for the flank guns. The difference between these two Q.As. divided by three (the number of gun intervals) will give the increase or decrease in Q.A. required between adjacent guns.

For example :—

Q.A. for No. 1 gun = 3° 45'

Q.A. for No. 4 gun = 2° 20'

Difference 1° 25'

÷ 3 = 28'.

Therefore Q.A. for No. 2 = 3° 45' - 28' = 3° 17'
 (given as 3° 15' to gun).

Q.A. for No. 3 = 3° 17' - 28' = 2° 49'
 (given as 2° 50' to gun).

59. Engagement of targets—Indirect

1. In the application of the combined sight rule, when firing indirect, the fact that guns are not normally concentrated inside the limits of the parallel zero lines entails fire being opened with all guns on the lowest of the elevations required according to range. A succession of lifts is then given until the highest of the required elevations has been reached.

If, however, the lines of fire are concentrated on a point, or target with little width, the principles contained in Sec. 49, 4 (The engagement of a target with little width—Direct fire), should be applied.

In all other respects the combined sight rule is applied as when firing direct.

2. Targets with width greater than the gun frontage can be engaged either by opening out the lines of fire by means of distribution (Sec. 57) or by keeping the guns on parallel lines and switching them from one portion of the target to another. The method employed will depend on the nature of the target and the time available. The second method saves calculation, and hence is the quicker of the two.

3. Targets with depth are engaged according to the general principles contained in Sec. 49, 7 (The engagement of targets with depth—Direct fire).

60. Crest clearance

1. The initial responsibility for determining whether the bullets will clear the crest in front of the guns rests with the fire controller. He must ensure that, when he chooses the gun line, clearance exists for the target or targets he intends to engage.

It will not always be necessary or practicable to resort to measurement by instruments and calculation of crest clearance during the reconnaissance for the gun line. With practice it

may often be possible to judge how far back the gun line can be situated without risk of the bullets striking the crest. If, however, the range is short and the crest steep, it will be necessary to check the clearance as outlined below before the gun line is decided on and the guns are brought up.

The subsequent responsibility will rest with the N.C.O. in charge of the gun line. He must ensure that after the guns have been laid initially for direction and elevation, no gun is fired unless the bullets will clear.

Further, he must, at the first opportunity, ascertain the lowest quadrant elevation at which the crest can be cleared and report it to the fire controller. He must check that no lower quadrant elevation is placed on the guns.

Calculations should always be made with reference to the highest point over which the guns may be called upon to fire.

The procedure for ascertaining the minimum quadrant angle either before or after the guns have occupied the position, and for checking whether the bullets will clear the crest after the guns have been given their initial line and elevation, is given below.

2. i. A crest up to 150 yards from the gun line.

In this case the axis of the bore and the trajectory can be taken as coincident as far as the top of the crest, *i.e.* the bullet has not had time to fall appreciably.

(a) To ascertain the minimum quadrant angle.

This will be the same as the angle of sight to the crest.

Procedure.

Set up a director at gun height and measure the angle of sight to the highest part of the crest. Add 15' to allow for bottom half of the cone, etc. Compare this angle with the quadrant elevation to hit the target. If the latter is the greater, the crest will be cleared.

If the guns are in position, this may be done by laying a gun on the crest with the sights at zero, and taking the elevation on the gun with clinometer. This angle will be the angle of sight to the crest.

(b) To ascertain after the guns have been laid for elevation and direction whether the crest is cleared.

Set the tangent sight at 400 yards. If the line of sight clears the crest the bullets will clear.

This will allow for the lower half of the cone and the fact that the line of sight with the sights at zero is some $3\frac{1}{2}$ inches above the barrel.

ii. A crest more distant than 150 yards from the gun line.

(a) To ascertain the minimum quadrant angle.

Procedure.

Obtain the range to the crest by range-finder. Increase it by 5 per cent. Look up in the Range Table the tangent angle corresponding to this range, and the depth of the bottom half of the cone at this range.

From gun height take the angle of sight to a point estimated above the crest by an amount equal to the depth of the lower half of the cone.

The minimum quadrant angle is equal to the above tangent angle plus this angle of sight. (Minus if the angle of sight is one of depression.)

If greater accuracy is required, take the angle of sight to the highest part of the crest and add to it the amount the bottom half of the cone subtends at the range to the crest, calculated from the V.I. graph. Proceed as above.

(b) To ascertain whether the crest is cleared after the guns are laid for direction and elevation.

A rough rule is to add 200 yards to the range obtained by range-finder to the crest, place the resultant range on the sights, and see whether the line of sight clears.

NOTE.—This 200 yards allows for 5 per cent. range-taking error in addition to lower half of the cone.

If greater accuracy is required, increase the range obtained by range-finder to the crest by 5 per cent.

Place the resultant range on the tangent sight.

Provided that the line of sight clears the crest by the amount of the lower half of the cone at the above range, the bullets will clear.

If still greater accuracy is required, convert the range as above into a tangent angle. Add to this the angle the lower half of the cone subtends at the range to the crest. Ascertain from the Range Table the range corresponding to the tangent angle. Place it on the tangent sight. If the line of sight then clears, the bullets will clear.

Theory.

If it were intended that the **centre bullet** of the cone should hit the crest, the quadrant angle on the gun would be the tangent elevation for the range to the crest plus or minus the angle of sight to the crest. Any slightly larger angle would therefore allow the centre bullet to clear.

3. The detail of the application of the above rules in practice will be found in Sec. 27, 5.

61. Night firing

(See Sec. 15, Night aiming and use of aiming lamp, and Sec. 28, Section drill—Night firing.)

1. This section contains the arrangements to be made for engaging a target at night. It should be noted that these arrangements can be applied to conditions of bad visibility such as fog, dust, or smoke.

The two cases which usually occur are dealt with in paras. 2 and 3, below.

2. Guns brought into position and laid by day.

The simplest method of night firing is when the guns can be brought into position by day, laid, and aiming posts planted. If more than one target is to be engaged, it would be necessary to place the guns on zero lines. At dusk, aiming lamps will be put out. Care must be taken that the lamps are put out at such a height that they will not be hit when firing with the lowest elevation to be used.

If the target is not visible from the gun line, indirect means must be employed to lay the guns.

3. Guns brought into position for the first time by night.*

i. When the gun position can be reached by day.

(a) If only one target, which is visible from the gun line, is to be engaged.

Mark the position of each gun by a small post (*gun peg*).

Place a second post (*direction peg*) for each gun in direct alignment of the gun peg and the position on the target for the gun concerned.

* An electric torch is essential for reading graduations and setting all instruments.

When the guns are brought up the procedure is as described in Section drill—Night firing.

To avoid exposing personnel in front of the gun line, it may often be desirable to place the direction pegs in rear of the gun pegs. In this case it will be necessary to screen the aiming lamps from the front when giving direction to the guns.

When the guns are being given direction from direction pegs in rear, they are laid with their dials at 180° on the aiming lamps held over the pegs. They are then swung round to 0° and aiming lamps planted in the normal way.

(b) If more than one target has to be engaged.

Here it is necessary to plant gun and direction pegs for each gun on parallel zero lines, so that the guns can be switched. The direction pegs may be in front of or behind the gun pegs.

If the targets are visible from the gun line to be occupied.

Gun pegs are planted for each gun. A zero line is selected and a direction peg for the pivot gun aligned on it.

Where a distant aiming point is available (Sec. 55), with a director measure the angle between the distant aiming point and the zero line for the pivot gun. Mount the director in turn over the remaining gun pegs, lay this angle off the aiming point and place the direction peg in this line.

Where no distant aiming point is available, the following method may be adopted. The procedure is described for two guns only, but can be extended to include four guns if required.

Plant gun pegs for each gun (G_1, G_2) (Fig. 35).

Place a direction peg (P_1) on the zero line for the pivot gun, either in front of or behind the gun position.

Measure the distance between the gun pegs (G_1, G_2) either by pacing or with tape or string.

By means of the V.I. graph calculate the angle $G_1T_1G_2$, i.e. the angle subtended at the range G_1T_1 by the distance G_1G_2 .

Set up the director over the other gun peg (G_2) and lay it on T_1 with the arrow at 0° . Lay off the angle found above right or left as required (left in case shown), and place a direction peg (P_2) on this line.

If more convenient, the angle T_1G_2B can be laid off by means of graticuled glasses or by any other means of measuring accurate lateral angles.

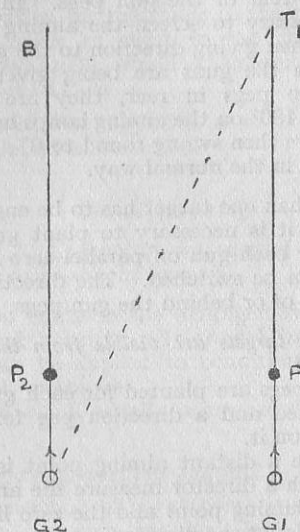


Fig. 35.

If the targets are not visible from the gun line to be occupied, but are visible from an observation post within voice control of the gun line.

Gun pegs are planted for each gun. Direction pegs on parallel zero lines are then placed in position by any of the indirect means already described.

If the director or post method is employed, two directors should be used.

In the director method the second director is mounted over each gun peg in turn and lays off the angle measured by the other director for that gun. The direction peg is then placed in this line.

In the post method, one director will be mounted over the gun peg for the pivot gun, the other being mounted over each of the remaining gun pegs in turn.

- (c) Before darkness falls, all data required to enable the various targets to be engaged must be obtained. These include some or all of the following :—

The angles of sight and ranges to the various targets.

The angular width of the targets.

The angles of switch.

Data affecting any existing or possible safety problem.

It is essential that the magnetic bearing of the zero line should be recorded as a check.

ii. When the gun position cannot be reached by day.

- (a) When a map is available.

The **true** (or **grid**) bearing from the pivot gun to the target or zero line is measured from the map and converted to compass bearing; using a compass, gun and direction pegs for each gun are planted in this bearing. (Sec. 62, 6, ii.) The guns are then mounted over the gun pegs.

If desired, a gun and direction peg for the pivot gun only can be planted by means of the compass. The guns are mounted, the pivot gun being mounted over its gun peg and given direction. The remaining guns are then placed on parallel lines by the post method (Sec. 54). The point of aim for each gun must be illuminated.

When using either of the above methods great accuracy cannot be expected.

- (b) When no map is available.

If circumstances allow of a light being shown on the spot where it is desired that the fire should fall, arrangements can be made to fire on a fixed line at short range with fair accuracy.

The procedure is described in Sec. 35, 2.

4. When guns are being relieved by other guns after dark, a gun peg, if not already there, will be planted under the socket of each of the guns to be relieved. The aiming lamps will be left out. The relieving guns will then be mounted over the gun pegs and will be laid for direction on the old aiming lamps. These can then be removed if required, and after the elevation has been placed on the guns by clinometer, those of the relieving unit substituted. The range card and all fire control details must be handed over by the unit relieved.

5. When firing is carried out from positions behind the forward localities, special precautions, such as posting sentries or wiring the danger area, must be taken to ensure the safety of our own troops when passing near the gun position.

62. Shooting from the map

1. Accurate shooting from the map is only possible when a map of scale 1/20,000 or larger is available. Where accuracy is not essential, for example for the engagement of areas well removed from the position of our own troops, maps of smaller scale should not be ignored, but it should be noted that the detail on such maps is not usually "surveyed in."

2. The principle of map shooting is that all calculations, both for direction and elevation, are made from the map. The method has certain definite advantages, namely :—

- i. No observation post is necessary.
- ii. Preparations to open fire can be made before the actual targets have been located.
- iii. Targets can be engaged which cannot be seen by ground observation.

3. In order to increase the width which can be engaged on parallel lines the gun frontage of a platoon can be extended up to 60 yards if desired.

4. The method entails fixing the position of the pivot gun on the map, and by various means laying out a zero line for each gun. These processes must be carried out in daylight, though the guns themselves need not be brought into action until after dark. Therefore orders for a map shoot to be carried out at night must reach the platoons concerned in sufficient time before dark.

5. The pivot gun can be fixed on the map either :—

- i. By comparing the detail on the ground with the detail on the map ; or, if this is not possible,
- ii. By resection. (See Manual of Map Reading, Photo Reading and Field Sketching, 1929, Sec. 56.)

Where time permits, greater accuracy is ensured by employing one method and checking with another.

It may be possible to obtain the aid of a survey unit where a very accurate location is necessary.

Oblique air photographs may be helpful.

6. Direction.

A zero line is chosen in the centre of the target area, or, if the targets are known, in the most suitable direction.

Two methods may be employed for placing the guns on their zero lines :—

- By means of a reference point.
- By compass.

i. By reference point.

A reference point which is both marked on the map and visible from the pivot gun is selected. (See Fig. 36.)

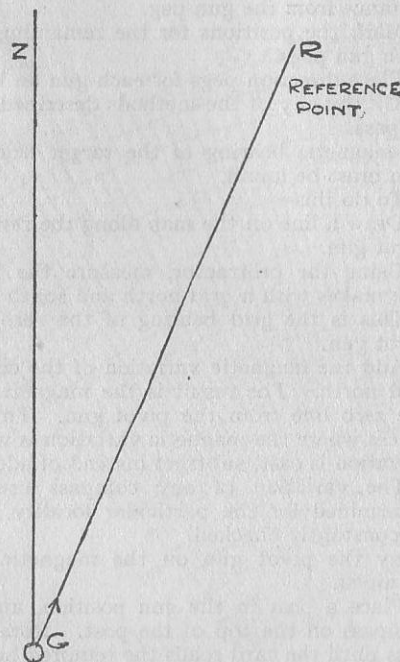


Fig. 36.

The zero line of the pivot gun is drawn on the map (GZ).

The line joining the pivot gun to the reference point is also drawn in (GR).

The angle RGZ is measured with a protractor.

(a) If the guns are in position :—

The pivot gun is laid on the reference point and swings through this angle.

The remaining guns are placed parallel to it by the most suitable method.

(b) If the guns are not in position :—

Mark the point G with a gun peg.

Mount a director centrally over it and swing through the angle RGZ.

Place a direction peg in the line GZ a suitable distance from the gun peg.

Mark the positions for the remaining three guns with gun pegs.

Place direction pegs for each gun on lines parallel to GZ, by any of the methods described in Sec. 61.

ii. By compass.

(a) The magnetic bearing of the target from the pivot gun must be found.

To do this—

Draw a line on the map along the zero line of the pivot gun.

Using the protractor, measure the bearing this line makes with a grid north and south line.

This is the grid bearing of the zero line of the pivot gun.

Add the magnetic variation of the compass from grid north. The result is the magnetic bearing of the zero line from the pivot gun. This applies to places where the magnetic variation is west. If the variation is east, subtract instead of add.

The variation of any compass used must be determined for the particular locality, and should be constantly checked.

(b) To lay the pivot gun on the magnetic bearing so obtained.

Place a post in the gun position, and place the compass on the top of the post. Rotate the compass until the card reads the required bearing.

Align a direction post on this bearing, using the hair line on the compass.

Proceed as described under the reference point method above, according to whether the guns are in position or not.

7. Distribution or concentration.

On the map, join the pivot gun to the two ends of the target. Measure with a protractor the angle thus formed at the pivot gun. Taking this as the angular width of the target, proceed as in Sec. 57.

8. Elevation.

On the map, measure the range to the target and note—

(a) Gun contour.

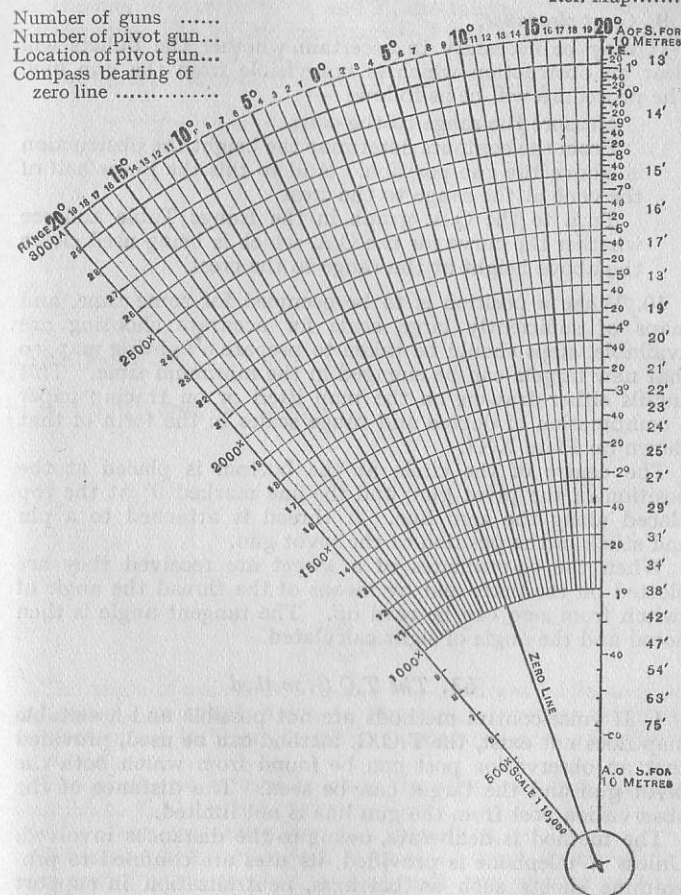
(b) Target contour.

PLATE XXI

FIGHTING MAP—PLATOON OR SECTION

(See Sec. 62, 10.)

Ref. Map.....



Date.....

Platoon Commander

Using the height the target is above or below the gun, find the Q.A. from the Q.A. graph.

If the latter is not available, the angle of sight can be calculated from the V.I. graph and the Q.A. determined in the normal manner.

9. Crest clearance.

It may be necessary to ascertain whether the bullets will clear an obstruction which is not visible from the gun line. The procedure will be as follows:—

Measure the range to the crest.

From the contours determine the height the obstruction is above the gun position. Add to this the lower half of the cone at the range to the crest.

Turn to the Q.A. graph in the Range Table and see whether the curve for the Q.A. which is being used clears the above height at the range to the crest.

10. When a position is to be occupied for some time, and maps of sufficiently large scale for accurate shooting are available, steps should be taken to prepare a fighting map, so that new targets can be engaged in the minimum time. This entails either drawing on the map itself or on tracing paper a combination of degree and range scales in the form of that shown on Plate XXI.

The centre of the circle at the bottom is placed at the position of the pivot gun, and the line marked 0° at the top placed along the zero line. A thread is attached to a pin and stuck in the position of the pivot gun.

When the co-ordinates of a target are received they are plotted on the map, and by means of the thread the angle of switch from zero can be read off. The tangent angle is then noted and the angle of sight calculated.

63. The T.O.G. method

1. If voice-control methods are not possible and a suitable map does not exist, the T.O.G. method can be used, provided that an observation post can be found from which both the pivot gun and the target can be seen. The distance of the observation post from the gun line is not limited.

The method is deliberate, owing to the distances involved. Unless a telephone is provided, its uses are confined to programme shoots such as barrages, neutralization in support of prearranged attack, etc.

Owing to its lack of elasticity and the time required for arrangements, this method should be avoided when any other method is possible.

2. i. A target of width equal to or less than the gun frontage.

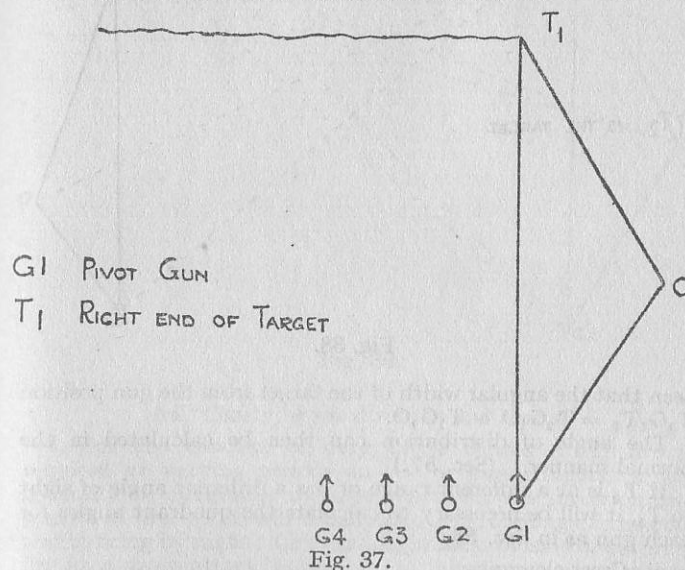
The ranges OG_1 and OT_1 are taken by the range-taker. (Fig. 37.)

The angle T_1OG_1 is measured with the director.

The angles of sight to G_1 and T_1 are taken.

The angle OG_1T_1 and the range G_1T_1 are obtained from the plotter. (See Sec. 14, 4.)

The Q.A. is calculated as described in Sec. 58.



The angle of switch T_1G_1O and the quadrant angle are sent by orderly or taken down to the guns, together with the method of fire to be employed and orders when to open fire.

At the guns.

The pivot gun is used to place the remaining guns on lines parallel to G_1O by one of the methods described in Secs. 54 or 55. Zero posts are planted in these lines.

When the angle of switch is received, guns swing off the zero posts by this angle. Aiming posts are planted and the target is engaged according to the orders received.

ii. A target wider than the gun frontage.

It will be necessary to determine the angular width of the target from the gun position.

Procedure.

The range-taker takes the range OT_2 (Fig. 38) in addition to those taken as in i.

The angle T_2OG_1 is measured.

The range G_1T_2 and the angle T_2G_1O are obtained from the plotter.

The angle T_1G_1O has already been obtained, and it can be

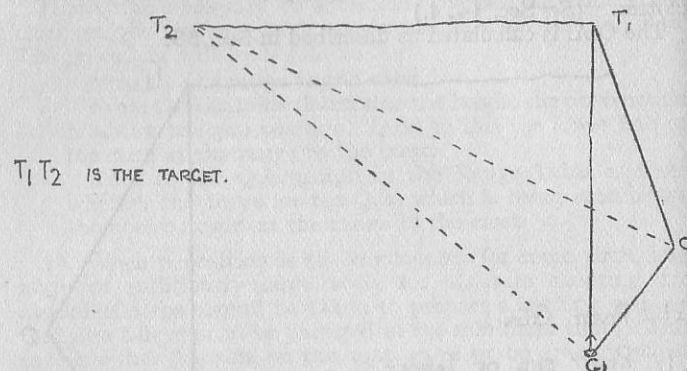


Fig. 38.

seen that the angular width of the target from the gun position $T_1G_1T_2 = T_2G_1O - T_1G_1O$.

The angle of distribution can then be calculated in the normal manner. (Sec. 57.)

If T_2 is at a different range or has a different angle of sight to T_1 , it will be necessary to calculate the quadrant angles for each gun as in Sec. 58.

iii. Crest clearance.

If there is a crest X (Fig. 39), invisible from the guns, and there is a doubt as to whether the bullets will clear, the procedure is as follows :—

Measure angle XOG_1 , and angle of sight from O to X.

Obtain from range-taker range OX.

As before, solve triangle XOG_1 to obtain G_1X and angle OG_1X . By comparison of the angles OG_1X , OG_1T_1 and OG_1T_2 , it can be determined whether the obstruction is in the line of fire.

If so, using the V.I. graph, determine the height X is above G_1 . Add to this height the depth of the cone at the range G_1X (from Q.A. graph at top).

Plot this height on the Q.A. graph at the range to the

obstruction. If the curve for the Q.A. to be used clears, the bullets will clear.

3. A specimen form to simplify the booking of the data and the subsequent calculations is given (p. 184). The data obtained by measurement is underlined. In practice, all data should be obtained before calculation is commenced.

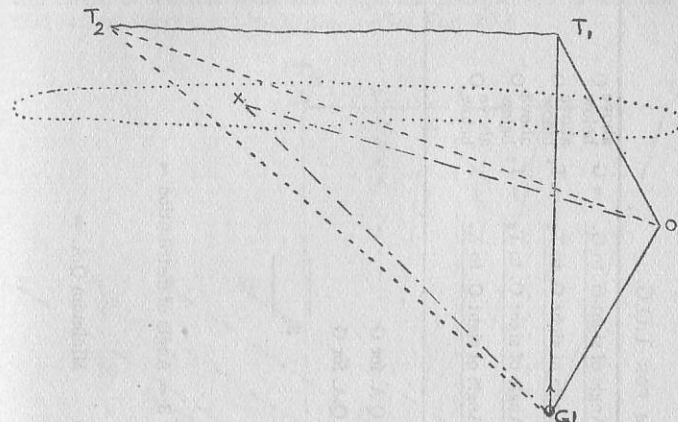


Fig. 39.

64. Charts for fire direction and control

1. For the conduct of programme shoots, when fire is required at varying periods on one or more targets, it will generally be preferable to issue charts for the direction and control of fire. This will usually apply to shooting off the map and to firing by night; for example, in the provision of covering fire for a dawn attack, harassing fire, counter-preparation, etc.

2. **Fire direction charts** may be prepared either by the B.M.G.O. or the M.G. Company Commander, with the object of allotting tasks to individual platoons, or, occasionally, sections. A suitable form is shown on p. 186.

3. **Fire control charts** are made up by platoon commanders, one for each gun, and are interpreted by a N.C.O. at each gun. They are prepared from data obtained from the fire direction chart, if issued, and by measurement.

The chart contains the actual detail of switches, timing and rates of fire, and the quadrant angle and traverse to be employed for each target. A suitable form is shown on p. 187.

SPECIMEN FORM FOR T.O.G.

$\frac{O.G.}{=}$	$\frac{\text{Angle of sight O. to G.}}{=}$	$\frac{\text{above O. below}}{=}$	<div style="display: flex; justify-content: space-around;"> <div> <p>Elevation.</p> <p>Ⓔ Ⓕ Ⓖ Ⓗ</p> </div> <div> <p>Distribution.</p> <p>Ⓔ Ⓕ Ⓖ Ⓗ</p> </div> </div>
$\frac{O.T_1}{=}$	$\frac{\text{Angle of sight O. to } T_1}{=}$	$\frac{\text{above O. below}}{=}$	
$\frac{O.T_2}{=}$	$\frac{\text{Angle of sight O. to } T_2}{=}$	$\frac{\text{above O. below}}{=}$	
$\frac{O.X.}{=}$	$\frac{\text{Angle of sight O. to X.}}{=}$	$\frac{\text{above O. below}}{=}$	
Wind.			
$G.T_1 =$	$\frac{Q.A. \text{ for } G.}{=}$		<div style="display: flex; justify-content: space-around;"> <div> <p>Divided by 3 = Angle of distribution =</p> </div> <div> <p>X above G. below</p> </div> <div> <p>Minimum Q.A. =</p> </div> </div>
$G.T_2 =$	$\frac{Q.A. \text{ for } G.}{=}$		
Angle of switch for T_1			
Angle of switch for T_2			
Width of target (difference) =			
Width of gun frontage			
Difference			
$X.G.O. =$			
$G.X. =$			

When firing indirect by day, it will often be advantageous to prepare a simplified form of chart for use at the guns.

4. The angle of deviation from zero of any target is the actual deflection from the zero line to bring the gun on to its correct position on that target. It is formed by combining the angle of switch with the angle of distribution or concentration, or its correct multiple. (See Fig. 40.)

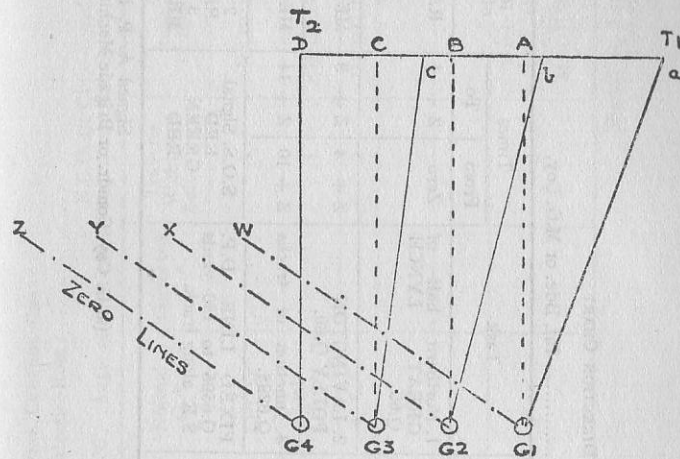


Fig. 40.

Angle ZG_4T_2 = Angle of switch.

CG_3C = " distribution.

cG_3Y = " deviation from zero, No. 3 gun.

bG_2X = " " " No. 2 gun.

aG_1W = " " " No. 1 gun.

Example:—The angle of switch for a certain target is Right 11° , the angle of distribution is 30 minutes. No. 4 is the pivot gun. It is required to find the angle of deviation from zero for No. 1 gun.

No. 1 gun has to be swung to the right through the angle of switch = Right 11° , and also (still in the same direction) through three times the angle of distribution = $3 \times \frac{1}{2}$ deg. = $1\frac{1}{2}$ deg.; the angle of deviation from zero is therefore Right $12\frac{1}{2}^\circ$ for this particular gun and target.

If the switch had been Left 11° , the angle of deviation from zero would have been Left $9\frac{1}{2}^\circ$.

FIRE DIRECTION CHART

REF. MAP.

..... Inf. Bde. or M.G. Coy.

Date.....

Unit and Role	Location	Task	Times		Rate of fire	Remarks
			From	To		
Blankshires No. 1 Platoon (supporting guns).	Near Tumulus Q. 68.	1. Northern half of GREAT LYNCH Q. 69.	Zero	Z + 4	RAPID	
	Pivot gun laid on track junction Q. 6595.	2. LAVINGTON FOLLY Q. 69.	Z + 4	Z + 8	MEDIUM	
		3. Junction of tracks Q. 6295.	Z + 10	Z + 14	MEDIUM	
	60 yards frontage.	FIXED LINE. D.P. Q. 6595 to 150 yards S.E. along track.	S.O.S. Signal. RED GREEN RED		2 min. RAPID 3 min. MEDIUM	

Signed A. P. BLANK, Capt.
(M.G. Coy. Comdr. or Brigade Machine-Gun Officer.)

FIRE CONTROL CHART

No. 1 Platoon—Role.....

Magnetic bearing of zero line 22° 30'. Angle of switch to corrected zero line R. 4°.

No. 4 Gun.

Task	Clock time		Zero time		Angle of deviation from zero	Normal Q.A.	Corrected Q.A.	Traverse Right and Left—Taps	Rate of fire	Remarks
	From	To	From	To						
1			Zero	Z + 4	R. 12° 40'	3° 45' Lift 20'		2	RAPID {	Fire one minute on each elevation alternately.
2			Z + 4	Z + 8	L. 5° 30'	4° 25' Lift 25'		1		
3			Z + 10	Z + 14	L. 6° 40'	4° 55'		2	MEDIUM	Do.
Fixed line.	S.O.S. Signal. RED GREEN RED.				R. 2° 10'	3° 50'		3	2 min. RAPID 3 min. MEDIUM	

Signed G. SMITH, Lt.
Platoon Commander.

Date

N.B.—Q.As. are always elevation if not marked DEP

5. When zero lines are laid out before the targets have been decided, it may occur that the zero line originally chosen is not the most suitable for the targets (*see* footnote, p. 154). In this case the zero line should be corrected by the angle of switch to a new and suitable zero line, and the fire control chart made out with reference to the latter.

6. It should be noted that both the Q.A. as calculated for normal atmospheric conditions, and the Q.A. corrected for the conditions at the time of firing, are entered on the chart, if necessary.

CHAPTER X

FLANKING AND OVERHEAD FIRE

65. *General considerations*

1. The provision of supporting fire to our own troops is the main tactical role of the machine gun. The safety of the troops to whom such support is being given must be the first consideration of the machine-gun commander.

2. Supporting fire can be provided either from the flank of a line of advance or defended locality or by overhead fire, that is, when the trajectory passes over the heads of our own troops. Where possible, flanking fire positions should be sought, not only because of the greater fire effect generally obtained from the beaten zone in enfilade, but also because fire from a flank can be put down with safety considerably closer to the troops being supported than can overhead fire. Before the occupation of a position for the purpose of overhead fire it is necessary to determine that such fire will be safe to our own troops. This increases the time required for the guns to be brought into action.

3. In order that the safety of the troops may be ensured, it is essential that their position or movements should be observed by or known to the fire controller.

In defence, this should not present any serious difficulty. In attack, the possibility of observing the movements of our own troops will depend on various factors, *e.g.* the nature of the ground (whether open, close, flat, or hilly), obstructions to the field of view, bad visibility, smoke screens, etc. Since such observation can hardly be assured, it is evident that considerable caution will have to be exercised, and that without a time table definite limitations may be imposed on the machine guns supporting the attack.

4. Apart from the above considerations, the machine gun, by reason of its stable mounting and the close grouping of its fire, is well suited to carry out overhead fire with safety to our own troops.

5. Flanking and overhead fire are governed by definite rules, which are contained in the following sections.

In solving any problem in connection with the safety of our own troops, the worst possible case must be taken as a basis for applying the rule.

66. Flanking fire

The following are the rules for flanking fire :—

The diagrams referred to in Plate XXII illustrate examples in defence (Fig. 1) and attack (Fig. 2).

- i. The line of fire must not be closer than 3° to the line joining the gun and the flank of our own troops.

In Fig. 1, A represents the flank of our own troops and GB the line of fire. For safety, the angle AGB must be 3° or greater.

In Fig. 2, GB is the line of fire to engage a target. If our riflemen are advancing in the direction shown, as soon as any man reaches the line GC, fire must cease.

- ii. The 3° limit extends to 3000 yards away from the gun.
If C in both diagrams represents a point 3000 yards away, our own troops, to be safe, must not cross the line GC at any point.
- iii. This type of fire must not be attempted if the position of our own troops in the vicinity of the danger area is unknown.

As already pointed out, this entails either observation of our own troops or a timed programme, based on a rate of advance which must not be exceeded by the rifle companies concerned.

- iv. Arrangements must be made to prevent traversing inside the 3° limit.
- v. Careful allowance must be made for side winds.

For example, if in Fig. 1 a wind was blowing from the left requiring an allowance of L. $40'$, it would be necessary to place B 40 minutes to the left of its present position, or, in other words, increase the safety allowance to $3^\circ 40'$.

67. Overhead fire

1. Rules for overhead fire.

- i. Ranges to **our own troops** must be known to within 5 per cent., i.e. taken by range-finder, or from a map of not less scale than 1/20,000.

- ii. Fire must not be delivered over the heads of our own troops when the range to **those troops** exceeds 2000 yards.

- iii. It must be ensured that the bullets shall pass at a certain minimum height above the heads of the troops fired over.

- iv. Barrels and tripods must be in good order.

2. Clearance and minimum clearances.

- i. "Clearance" at any point is the vertical height of the centre shot of the cone above that point. In accordance with

PLATE XXII FLANKING FIRE

(See Sec. 66.)

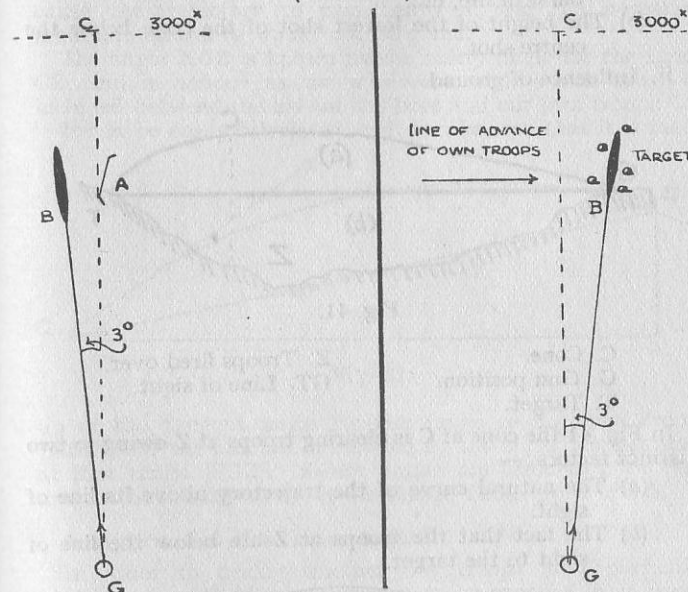


Fig. 1.—Defence.

A is a rifle locality.
B is a fixed line to it.
G is the gun line.
GC = 3000 yards.

Fig. 2.—Attack.

B is the target.
G is the gun line.
GC = 3000 yards.

rule iii in para. 1, above, the minimum clearance for every range to our own troops has been calculated, and is laid down on pp. 2 and 3, Range Table. In these calculations allowances have been made with a sufficient safety margin on account of:—

- (a) Permissible errors in range-taking (up to 5 per cent.).
- (b) Normal climatic variations.
- (c) Errors in sighting of guns and clinometer adjustment.
- (d) Movement of the tripod in settling in during the first burst of fire, etc.
- (e) The height of the lowest shot of the cone below the centre shot.

ii. Influence of ground.

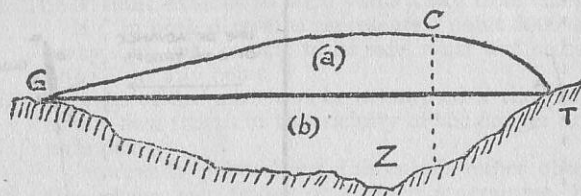


Fig. 41.

- | | |
|------------------|-----------------------|
| C. Cone. | Z. Troops fired over. |
| G. Gun position. | GT. Line of sight. |
| T. Target. | |

In Fig. 41 the cone at C is clearing troops at Z owing to two distinct factors:—

- (a) The natural curve of the trajectory above its line of sight.
- (b) The fact that the troops at Z are below the line of sight to the target.

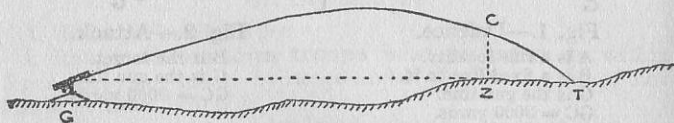


Fig. 42.

In Fig. 42 the cone at C is clearing troops at Z on account of the curve of the trajectory only. The problem to be solved, in Figs. 41 and 42, before overhead fire can be opened, is whether the cone will clear the point Z by the minimum safety clearance.

3. The safety angle.

The minimum clearance can also be expressed as an angle. Consider Fig. 43.

G is the gun.

GX the axis of the bore.

SZ the minimum clearance for our troops at Z.

Theoretically, there is only one position of the axis of the bore which will cause the centre shot to pass exactly through S. Suppose GX to be this position; any lower position would cause the trajectory to pass below S, and the necessary minimum clearance would not be given.

The angle XGZ is known as the safety angle for the range GZ, and is defined as the minimum angle which must be included between the axis of the bore and our own troops.

It can be easily calculated, as it can be seen that it is made

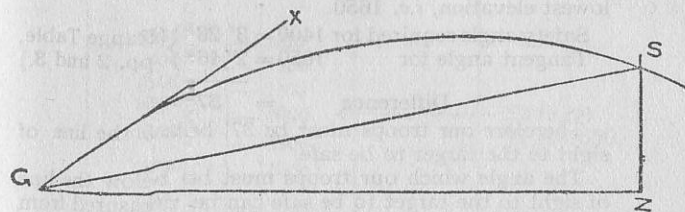


Fig. 43.

up of the tangent angle for the range to our own troops (XGS) and the amount subtended by the minimum clearance at that range (SGZ). Safety angles are calculated for each range, and are laid down in the Range Table, pp. 2 and 3.

4. Application of the safety angle.

In order to decide whether our troops in a particular position are safe when a target is to be engaged, it is necessary to compare the safety angle for the range to our own troops with the tangent angle for the range to the target. If combined sights or searching back is used, the tangent angle for the lowest range must be compared. The procedure is governed by the following rules:—

- i. If the safety angle required at the range to our own troops is less than the lowest tangent angle to be employed, our troops are safe.
- ii. If the safety angle required is equal to the tangent angle, our troops are safe, provided they are not above the line of sight to the target.

Example :—

If our troops are advancing along the line of sight towards a target the range to which is given as 1950 yards, fire must be stopped when they reach a point 1500 yards from the gun, because the tangent angle for 1900 = $3^{\circ} 47'$ = the safety angle for 1500 yds. (Range Table, p. 3).

- iii. If the safety angle required is greater than the tangent angle, our troops are not safe unless they are below the line of sight to the target to the extent of the difference between these two angles.

Example :—

Range by range-finder to target, 1700 yards.

Range by range-finder to own troops, 1400 yards.

Combined sights must be used, therefore work from lowest elevation, i.e. 1650.

Safety angle required for 1400 = $3^{\circ} 23'$ } (Range Table,
Tangent angle for 1650 = $2^{\circ} 46'$ } pp. 2 and 3.)

$$\text{Difference} = 37'$$

Therefore our troops must be $37'$ below the line of sight to the target to be safe.

The angle which our troops must be below the line of sight to the target to be safe can be measured from the gun position by means of the graticules in field-glasses, by any other accurate method of measuring vertical angles, or by the slide rule.

5. The use of the slide rule.

In order to save the labour entailed in comparing the tangent angles and safety angles as above, the Machine-Gunner's Slide Rule (Sec. 14, 11) is provided.

To use the slide rule in the case mentioned in the example in 4, iii, above, set 1400 yards on the "Range to Own Troops" scale against 1650 yards on the "Range to Target" scale. This will cause the slide to project above the top of the rule.

Hold the rule vertically at the full length of the string, bringing the shoulders at the top of the rule Y, in Fig. 44, along the line of our own troops nearest the target.

If the target can be seen above the top of the slide X, our troops are safe.

In effect, the height XY subtends at 24 inches from the eye the amount our troops must be below the line of sight to the target to be safe.

On the right side of the rule will be found a scale on which this amount is indicated when the slide rule is set.

6. The practical use of the slide rule.

The slide rule is employed in the following cases :—

- i. In the reconnaissance for a position from which to engage a definite target over the heads of our troops

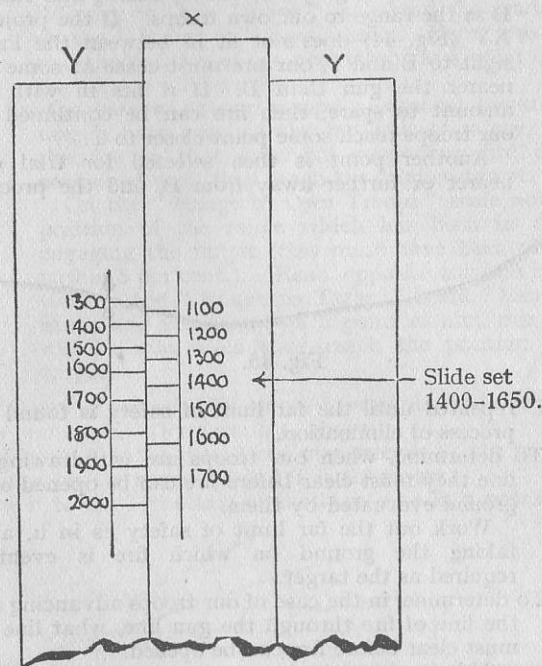


Fig. 44.

who are stationary, to determine whether fire can be opened with safety.

The slide rule is set and used as in paragraph 5, above.

- ii. To determine how near to a target our advancing troops can be supported by overhead fire with safety.

The nearest position of our troops to the target is known as the "far limit of safety" for that particular target.

The problem is solved by trial and error, using the slide rule as follows :—

The fire controller picks up a point (B) short of

the target T (Fig. 45) up to which he estimates our troops could advance with safety. He orders his range-taker to take the range to this point and obtains the range to the target. He sets the slide rule as in paragraph 5, above, taking the range to B as the range to our own troops. If the projection XY (Fig. 44) does not fit in between the lines of sight to B and T, our fire must cease at some point nearer the gun than B. If it fits in with some amount to spare, then fire can be continued until our troops reach some point closer to T.

Another point is then selected for trial either nearer or further away from B, and the procedure



Fig. 45.

repeated until the far limit of safety is found by a process of elimination.

- iii. To determine, when our troops are withdrawing, the line they must clear before fire can be opened on the ground evacuated by them.

Work out the far limit of safety as in ii, above, taking the ground on which fire is eventually required as the target.

- iv. To determine, in the case of our troops advancing along the line of fire through the gun line, what line they must clear before fire can be opened.

This position is known as the "near limit of safety" for the particular target concerned.

Using the graduations marked in red on the "Range to Own Troops" scale, proceed as in ii, above.

In the following 3 cases the slide rule is set with the slide flush with the shoulders at the top of the rule.

- v. To determine the near and far limits of safety when our troops are on the line of sight to the target.

Opposite the range to the target on the "Range to Target" scale read the graduations both on the red and the black scale on the slide. These graduations indicate the ranges to the near and the far limits of safety respectively.

The actual positions on the ground are found by trial and error.

- vi. When our troops are stationary, to place overhead fire as close to them as possible.

Opposite the range to our own troops on the "Range to Own Troops" scale read the graduation on the "Range to Target" scale. Using this range and the position of our own troops as a point of aim, our troops will be safe.

- vii. In the case when our troops, advancing towards the target, have reached the far limit of safety, to lift the fire so that overhead supporting fire can be continued until they reach the original target.

On the "Range to Own Troops" scale note the position of the range which has been in use for engaging the target (this must have been obtained within 5 per cent.). Read opposite this the graduation on the "Range to Target" scale. Using this range and the target as a point of aim, our troops will be safe when they reach the position of the target.

7. Theory of the rules for comparison of the safety angle with the tangent angle. (Paragraph 4, above.)

In Fig. 46 G is the gun, Z our own troops, SZ the minimum clearance for the range GZ and T is the target.

Now if to hit T the axis of the bore were in a position GX

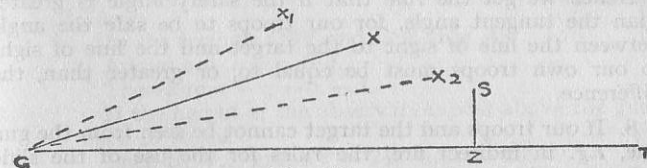


Fig. 46.

and the centre shot passes through S, XGZ, the safety angle, is equal to the tangent angle to hit T, and our own troops are safe.

If to hit T the position of the axis of the bore were in a position GX₁, the trajectory of the centre shot would pass above S and our troops are safe.

Hence we get the rule that if the safety angle (XGZ) is equal to, or less than, the tangent angle (X₁GT) our troops are safe provided they are not above the line of sight to the target.

If, however, to hit T the position of the axis of the bore

were GX_2 , the trajectory would pass below S, and our troops at Z are not safe. Here the safety angle (XGZ) is greater than the tangent angle (X_2GT).

We have only considered the case where our troops are on the line of sight to the target. The ground will often be favourable, and our troops (Z) may be below the line GT.

In Fig. 47 the ground is favourable, and our troops, instead of being at Z are at Z_1 ; we can therefore lower the axis of the bore from GX to GX_1 , where X_1GZ_1 is the safety angle for the range GZ_1 (or GZ) and X_1GT is the tangent angle to hit T.

Here it can be seen that the safety angle X_1GZ_1 is greater than the tangent angle (X_1GT) by the amount the ground

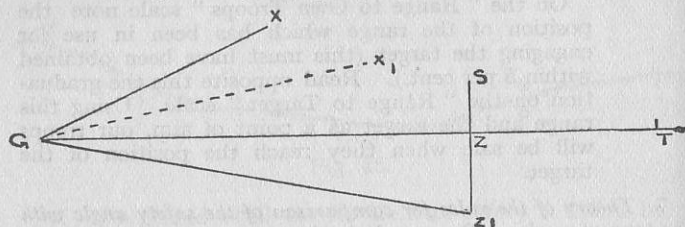


Fig. 47.

has given us (ZGZ_1), and our troops are safe. The ground must give us this amount, or our troops would be unsafe.

Hence we get the rule that if the safety angle is greater than the tangent angle, for our troops to be safe the angle between the line of sight to the target and the line of sight to our own troops must be equal to, or greater than, the difference.

8. If our troops and the target cannot be seen from the gun line, *e.g.* in indirect fire, the rules for the use of the slide rule must be modified unless an observation post can be found which fulfils the following conditions:—

- i. It must not be higher than the gun line by more than six feet.
- ii. The target, the gun line and the movements of our own troops along the line of fire in the vicinity of the danger area must be visible.
- iii. The ranges observation post–target and gun–target must be approximately equal.

9. The use of an observation post which is not within six feet in height of the gun line in practice presents a complication, and every effort must be made to avoid it by the

careful siting of guns and observation post in relation to each other.

When this is unavoidable, the following will be the procedure, which only holds good if the conditions in paragraph 8, ii and iii, above, are fulfilled:—

- i. Find the angle subtended by the difference in height between the observation post and the guns at the range to our troops. Subtract from it the angle subtended by this height at the range to the target.
- ii. Set the slide rule in the ordinary way. Using the scale on the right side, increase the amount projecting by

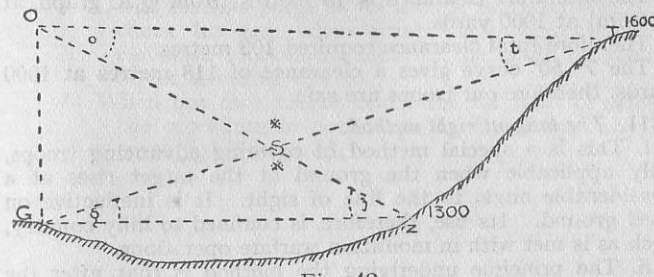


Fig. 48.

the difference obtained in i, above. Now use the rule in the ordinary way.

Theory.

In the triangle OST and GSZ (Fig. 48).

Angles $o + t = g + z$.

Therefore $o - g = z - t$.

If the height of the observation post above the guns were 10 yards,

Then by V.I. graph $t = 21'$ and $z = 26'$.

Difference $5'$.

This is the amount by which the projecting portion of the slide has to be increased before using the slide rule.

10. *Safety calculated from the map.*

- i. Plot on the map the gun line, the position of our own troops and the target.
- ii. Ascertain from the contours the highest point over which there is a possibility of fire being directed. Subtract from this height the height of the gun line; this gives the height of the crest on which the troops are above the gun line.
- iii. Add to this height the minimum clearance required for

the range to our troops. From the Q.A. graph determine whether the trajectory curve for the Q.A. for the target clears this height at the range to our troops.

Example :—

	Range	Contour level
Gun line	—	105 metres.
Target	2550 yards	120 „
Own troops	1000 „	190 „

Target is 15 metres above the gun, therefore Q.A. required is 7° 50'. (Taken from Q.A. graph, using a range of 2500.)

Our troops are 85 metres above the gun.

The minimum clearance is 18 metres (from Q.A. graph, at bottom) at 1000 yards.

Therefore total clearance required 103 metres.

The 7° 50' curve gives a clearance of 118 metres at 1000 yards, therefore our troops are safe.

11. The tangent sight method.

i. This is a special method of covering advancing troops, only applicable when the ground at the target rises at a considerable angle to the line of sight. It is ineffective on level ground. Its use, therefore, is confined to hilly country, such as is met with in mountain warfare operations.

ii. The principle underlying the method is that after the gun has been laid to hit the target by direct means, the tangent sight slide is raised by an amount depending on the range to the target. The line of sight thus given will indicate the furthest point to which our troops can advance with safety.

iii. The rules for the employment of overhead fire by this method are :—

- The troops over whose heads the fire is being directed must be kept under observation.
- The range to our own troops must not exceed 2000 yards.
- Barrels and tripods must be in good order.
- The range to the **target** must be known to within 5 per cent. of error.
- The range to the target must not be less than 700 yards.
- If the range to the target is between 700 and 1200 yards, the tangent sight slide will be set at 500 yards above the actual range.

If the range to the target is over 1200 yards, the slide will be set at 400 yards above the actual range.*

* These rules will give practically the same clearance over our own troops as demanded in Range Table, pp. 2 and 3. It must be realized that they only apply to troops approaching the target, and not to those in close proximity to the guns.

iv. Procedure.

- The fire unit commander, having obtained the range to the target from the range-taker, orders the range or ranges to the guns and indicates the target.

He then orders "Up 500" or "Up 400" as required.

The firer adjusts the tangent sight slide accordingly and notes where the new line of sight cuts the ground. This point marks the position up to which our own troops may advance with safety, so long as the fire is directed at the target. The firer will use this point as an aiming mark on which to check his aim when firing. Any corrections in elevation to obtain effect will be made by means of the elevating wheel.

- When our own troops reach the far limit of safety, the procedure in paragraph 6, vii, above, may be employed if required.

CHAPTER XI

FIRE PLAN AND FIRE DISCIPLINE

68. *Fire plan, direction and control*

1. Machine-gun fire may be required immediately to meet an emergency, or as part of an organized fire plan.

2. In the latter case, the allotment of targets by platoon tasks is made by either the brigade or unit commander, depending on the nature and scope of the operations in hand. In making the allotment an indication should be given as to the amount of ammunition to be expended on each target and the period for which it is to be engaged. In all but the most static form of warfare the allotment of tasks to platoons within the battalion is carried out by the machine-gun company commander, who is responsible that the tasks are distributed so that the best fire effect is obtained. The actual method in which the target is engaged will be the responsibility of the platoon commander.

3. **Fire direction** is the term used for the orders given by a commander of two or more fire units as to how their fire is to be applied, and covers, therefore, the immediate orders given to a fire controller.

When firing direct, the platoon commander only directs the fire of his two sections, the fire being controlled by the section commander. The only means of communication at the disposal of a platoon commander for directing the fire of his platoon is by orderly or signal. As a guide, therefore, it is considered that where a whole platoon is required to fire over one arc, the two sections should not be further apart than 300 yards. To minimize the effect of shell fire and to assist concealment, they should not be closer than 100 yards.

The platoon commander, in deciding whether he will order one arc for both sections or an arc for each, should remember that for ranges over 1500 yards the fire of four guns is necessary. Therefore, when targets over that range have to be engaged, they must be included in the arc of each section.

When firing indirect, the platoon commander controls the fire of the platoon, unless the tactical situation demands his whole attention, or he is concerned with liaison duties. In these cases he will delegate the fire control to the platoon serjeant.

Owing to the difficulty of locating targets exactly, a platoon commander may often receive a target in general terms, *e.g.* a patch of gorse or front edge of a wood. In this case he must by every means in his power, attempt to locate the exact position of the enemy in the locality described, so that ammunition is not wasted by firing on unoccupied ground.

When firing over an arc, platoon and section commanders must exercise great care in the selection of targets and the moment to open fire. Targets which will have the greatest effect on the operations must be engaged first, and fire unit commanders should not allow themselves to be led into firing on targets which may be more obvious but not so dangerous tactically.

Premature opening of fire against unimportant targets will have the effect of disclosing the positions of the guns unnecessarily and drawing enemy fire.

4. In deciding on the rate of fire to be used, the following factors must be taken into consideration:—The tactical situation, the target, the range, the state of the ammunition supply and the effect it is desired to produce in a given time.

Rates of fire are as follows:—

Rapid.—About 250 rounds a minute.

This rate should be used for very favourable or fleeting targets, or in a critical situation. It should not be maintained for more than a few minutes.

Medium.—About 125 rounds a minute.

This rate can be maintained for about half an hour without strain to gun or equipment.

Slow.—60–75 rounds a minute.

This rate should be used when fire over a long period is required, *e.g.* for harassing fire.

5. In the occupation of a position it will be the duty of the platoon commander to determine before the position is occupied that the first target can be engaged or task carried out with safety to our own troops. When he himself is not controlling he will, in his orders for the occupation of the position, inform the fire controller or controllers concerned that it is safe to fire on the first target, and will point out the position of our own troops. The responsibility for subsequent safety will be with the fire controller.

The platoon commander should assist by informing him as to the movements of our own troops reported by the observer or notified by other means.

The fire controller is responsible that no downward correction is given until the safety has been rechecked.

6. The duties of the fire controller.

i. Direct fire.

The duties of the fire controller (section commander) when firing direct include :—

- Selection of the gun positions.
- Selection and organization of the control post.
- Organization of the arc.
- Issue of fire orders.
- Observation and correction of fire.

Of these, the selection of gun positions is dealt with in Secs. 31 and 32, the organization of the arc in Sec. 13, the issue of fire orders in Sec. 70, and the observation and correction of fire in Sec. 45 and Sec. 70.

ii. Organization of the control post for direct fire. (See also Sec. 31.)

(a) The control post must fulfil the following conditions :—

- It must be inconspicuous.
- It must afford a view over the whole of the allotted arc.
- Its position must be such that the fire controller can see the guns.
- It must be within voice-control distance of the guns.

(b) As certain orders are given by signal through the medium of the No. 2, the best position will be on the left of the gun line, where the fire controller can both see the Nos. 2 and be seen by them. In cases where it is not possible to control by voice from the left of the gun position, a connecting file, normally a No. 3, must be placed to repeat the fire controller's signals for the benefit of Nos. 2.

(c) The fire controller and range-taker must work in close co-operation. The latter, on all occasions when a target is being indicated which has been estimated from a key range, should follow the indication, and give the Barr and Stroud range to the fire controller as soon as obtained.

(d) The section commander must command his section and observe his fire. When giving orders, therefore, he must ensure that they are correctly acknowledged and obeyed, before turning his attention to the target.

iii. Indirect fire.

The duties of the fire controller in indirect fire include :—

- Selection of the gun position and observation post. (Secs. 31 and 33.)
- Placing the pivot gun or all guns on their zero lines. (Chapter IX.)
- Calculation of the elevation. (Sec. 58.)
- Calculation of the distribution or concentration (if any). (Sec. 57.)
- Issue of fire orders. (Sec. 71.)
- Observation and correction of fire. (Sec. 45.)
- Arrangements for rapid switching. (Sec. 71, 4, iii.)

They are dealt with in Platoon drill—Indirect fire, and in the sections marked against each.

iv. An observation post for the control of indirect fire may be either in front of or behind the guns, and is not part of the gun line as when firing direct. The considerations affecting its organization are the same as for direct fire. (See subparagraph ii (a), above.)

69. Fire orders, direct and indirect

1. Fire orders are given in a sequence, laid down in Secs. 70 and 71, which must not be departed from.

Rigid adherence to the sequence will ensure that errors and omissions are detected immediately, and, further, that the personnel, knowing what to expect, will act the more quickly.

The orders must be given loudly and clearly, the fire controller facing towards the guns.

He must make up his mind what is the correct order to give before embarking on it. Long and unnecessary pauses, during which he is coming to a decision as to the next part of the order, can only result in inaccuracies and slovenly drill.

The recipients must have time to act on one portion of the order before another is given.

2. When it is necessary to give out angles the following form will be followed :—

4° 35'—Four degrees three five minutes.

12° 5'—One two degrees five minutes.

10° 20'—One owe degrees two owe * minutes.

The words "right" or "left," or "elevation" or "depression," will precede the number of degrees and minutes, when required.

* In all examples this form of phonetic spelling is used to represent the figure "0."

70. Direct fire orders

1. The sequence of a direct fire order is :—

- i. Range or ranges.
- ii. Indication of the target.
- iii. Method of fire.
- iv. Side wind allowance.
- v. Rate of fire (if required).
- vi. Order to fire.

When giving out the order, pauses should be made as under, until it is seen that the gun numbers are ready for the next part of the order.

After the range —To allow time to set the sights.

At various stages during the indication —Time must be given for points to be recognized. When degree methods of indication are used, a pause must be made to enable the angles to be measured.

After method of fire —To enable the guns to be laid.

After wind, if any —To allow of picking up a gun aiming mark.

2. Range or ranges.

i. Ranges, when ordered to the guns, will be given to the nearest fifty yards, and according to the following examples :—

- 700—Seven hundred.
- 1000—Ten hundred.
- 1400—Fourteen hundred.
- 1450—Fourteen fifty.
- 2000—Twenty hundred.
- 2300—Twenty-three hundred.
- 2350—Twenty-three fifty.

ii. For the first target the section commander will usually obtain the range from the range-taker. For subsequent targets, to save time, ranges are taken, or estimated, from the range card.

iii. One range is given to both guns, or a different range to each gun, in accordance with the combined sight rule. (Sec. 44.)

If one range is ordered to the two guns the range will be preceded by the word "All." E.g. "All—Twelve hundred."

If two elevations are necessary, they will be given in the form :—

"No. 1—Sixteen fifty."

"No. 2—Seventeen fifty."

iv. Except in the engagement of certain oblique targets, No. 1 gun is always given the lower elevation.

v. On the cautionary order preceding the range, that is either "All" or "No. . . ." the No. 2 concerned will raise his hand in acknowledgment by extending it behind No. 1's back, straight from the shoulder, and at such a height that it can be seen by the fire controller. He will drop it again as soon as he has heard the range for his gun. He does not drop his hand should he wish the range to be repeated.

vi. If the wind is sufficiently high to warrant a correction for elevation, the allowance required will be calculated (Sec. 41, 9, iii) and converted into yards. The range will be corrected before being given out.

3. Indication.

i. The section commander will indicate the target as laid down in Sec. 13. It should be noted that when switching from one target to another the last target is often the best aid in indication.

ii. When the dial or handwheel method of indication (Sec. 13, 3, ii (b)) is used, an additional tap Right and Left of the target should be included in the method of fire to allow for possible errors.

iii. No. 1 will call "Repeat" at the conclusion of the indication should it not be clear. He will not commence to lay his gun until told to do so by No. 2. (See paragraph 4, ii, below.)

4. Method of fire.

i. (a) Order, "Traversing right and left . . . Taps" (Sec. 48, 2).

Both guns are laid on the centre of the target. No. 1 gun traverses to the left first and No. 2 to right (Fig. 18, p. 144). If the order is given in degrees and minutes instead of taps (see Footnote, p. 148), the No. 1, by means of a hand angle, will note points Right and Left of the target at the limits of his traverse.

(b) Order, "Traversing" (Sec. 48, 3).

Both guns are laid on the left limit of the target. When it is desired to traverse from right to left the order will be :—

"From right to left traversing,"

in which case the guns are laid on the right limit of the target.

(c) Order, "Inwards traversing" (Sec. 48, 4).

No. 1 gun is laid on the right limit of the target, No. 2 gun on the left limit.

ii. On completion of the "method of fire" order, the section commander will raise his hand, elbow bent at right angles, the upper part of the arm in line with the shoulder. This indicates to No. 2 that he is to tell No. 1 to lay the gun.

If a signal is inconvenient the section commander may order "**Lay.**"

When No. 1 is ready he informs No. 2, who raises his hand as described in paragraph 2, above.

Attention is drawn to the opening sub-paragraph of Sec. 49, 5.

5. *Side wind.*

The section commander will either estimate the side wind required or calculate it to the nearest tap (Sec. 41, 9, iii). It will be ordered to the guns in the following form:—

Wind—Right (or Left) . . . Taps.

Nos. 2 drop their hands to signify that the order has been understood.

Nos. 1 tap their guns across by the number of taps ordered, pick up a gun aiming mark, and inform Nos. 2 when ready.

Nos. 2 raise their hands.

If the allowance required is more than 1°, it should be ordered in degrees. Nos. 1 by means of a hand angle pick up a gun aiming mark.

If no correction is necessary, this heading is omitted from the order.

6. *Rates of fire.* (Sec. 68, 4.)

If no order is given, "*Rapid*" is implied.

If it is desired to fire "*Medium*" or "*Slow*," the order will be given after the allowance for wind, if any.

7. *The order to fire.*

This will normally be given by the fire controller dropping his hand. On this signal, Nos. 2 will tap the Nos. 1 lightly on the back, saying "*Fire.*"

If "*Lay*" has been ordered verbally, it will be necessary to order "*Fire*" verbally also.

Attention is called to Sec. 45, 2, vii—Length of bursts.

8. The following paragraphs deal with the orders which may be given during a shoot.

9. "*Stop.*"

This order is normally given by signal, the arm being waved horizontally to and fro.

The Nos. 2 tap the Nos. 1 lightly on the back, saying "*Stop.*" The Nos. 1 immediately stop firing and relay on their original point of aim, or auxiliary aiming mark, if in use.

10. *Ranging corrections.*

i. *Direction.*

The section commander converts the necessary deflection into taps, which he orders to one or both guns as required. Nos. 1 pick up a gun aiming mark in the new line.

Examples:—

(a) **All— . . . Right two taps.**

(b) **No. 1— . . . Left three taps.**

ii. *Elevation.*

The section commander decides on the correction, and either gives out a new range or orders "*Up*" or "*Down*" by the amount required.

Examples:—

(a) **"All—Fourteen hundred."**

(b) **"All—Up two hundred."**

(c) **"No. 2—Up one hundred."**

(d) **"All—Down fifty."**

11. "*Go on.*"

This order may be given verbally or by making the signal to fire. (Paragraph 7, above.)

71. *Indirect fire orders*

1. The form of the orders given and the action to be taken will be found in Sec. 23 and in Sec. 27.

2. The sequence of an indirect fire order will be:—

- i. Zero lines.
- ii. Angle of switch (if any).
- iii. Elevation or elevations.
- iv. Out aiming posts.
- v. Load.
- vi. Distribution or concentration (if any).
- vii. Traversing right and left.
- viii. Side wind allowance.
- ix. Rate of fire (if required).
- x. Order to fire (as for direct fire).

3. *Notes on indirect fire orders.*

i. Zero lines. (See Sec. 51.)

Before giving out angles to the respective guns, the order "*Zero lines*" will be given. The angles are given to the nearest ten minutes

ii. Elevation or elevations. (See Sec. 58.)

If a correction for atmospheric influences is necessary, it will be added to, or subtracted from, the Q.A. before the latter is given out. (See Sec. 41, 9.)

Angles of quadrant elevation are converted to the nearest 5' before being passed to the guns.

iii. Distribution and concentration. (See Sec. 57.)

The order for distribution or concentration will always start with the pivot gun, for which the order "Nil" is given. The angles of deflection for the other guns are given to the nearest 5'.

The elevation is checked at individual guns after the order for distribution is given, to allow for the fact that the socket of the tripod is possibly not absolutely vertical. This is not necessary after "concentration," owing to the slight deflection involved.

iv. Traversing right and left. (See Sec. 57.)

The amount of traverse will be given in "taps," as for direct fire.

Nos. 1 and 2 guns traverse to the left first, Nos. 3 and 4 to the right first.

v. Side wind allowance. (See Sec. 41, 9, iii.)

The allowance is calculated for the range from the gun line, and ordered to the nearest 5'.

4. Orders during a shoot.

i. *Lifts.*

Lifts as required will be determined from column 3, pp. 2 and 3, Range Table, and ordered to the guns in the form:—

All—Up . . . mins.

This order may be given verbally or by signal as detailed in sub-paragraph ii (b), below.

ii. *Ranging corrections.*

(a) *Direction.*

The amount of switch required is measured by the director, with glasses, or by means of hand angles, according to the time available and the accuracy required.

The correction may be given verbally, or the following semaphore signals may be employed:—

T . . . Right 30'

L . . . Left 30'

To double or increase further the corrections, the code letter will be repeated as necessary.

(b) *Elevation.*

The fire controller estimates the correction required in hundreds of yards, converts this to angle by means of the Range Table, pp. 2 and 3, column 3, and orders the result in the form:—

All—Up (or Down) . . . degs. . . mins.

This order may be sent by semaphore signal as follows:—

U . . . Up 10'

N . . . Down 10'

To double or increase further the correction, the code letter will be repeated as necessary.

If during the shoot it is seen that any gun or guns are firing over or short as compared with the remainder, the order "**Check elevation**" will be given.

iii. *The engagement of a fresh target.*

(a) *Direction.*

The fire controller measures the angle of switch for the pivot gun as in sub-paragraph ii (a), above. So that the lines of fire may be parallel, before switching, he will order the guns to relay on their zero lines with dials and bar foresight at zero, by giving the order:—

All—On zero lines.

The angle of switch is then given out verbally, or by signal.

If the switch is greater than can be placed on the bar foresight, it may be convenient to correct the zero line on to the new target; in this case, the order for the angle of switch will be preceded by the words "**Zero lines.**" When time allows, the aiming posts should be planted in the new zero line.

(b) *Elevation.*

To obtain the new angle of sight, the difference in angle of sight between the old and the new target is measured with glasses, and added to, or subtracted from, the angle of sight already obtained for the first target. For large switches the angle of sight to the new target is taken with a director.

The Q.A. for the new target is calculated and ordered to the guns in the form:—

Elevation—All—(or No. . . .) . . . degs. . . mins.

(c) The remainder of the fire order is normal, depending on the type of target.

(d) During pauses in the firing, and at any other time when it is possible, it is the duty of the fire controller to measure switches, and, with the assistance of his range-taker, calculate Q.As. for all probable targets in his arc. This may reduce the time taken to open fire on new targets.

72. Examples of direct fire orders (See Sec. 49)

1. Target—A bush.

Range obtained by range-finder 1000 yards.

Fire order.

All—Ten hundred.

Tree—Right four o'clock—Bush.

Fire.

2. Target—The corner of a house.

Range obtained by range-finder 1700 yards.

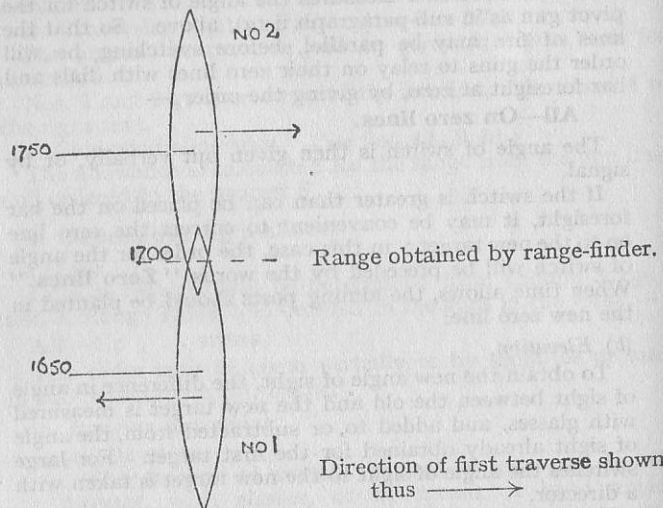


Fig. 49.

Fire order.

No. 1—Sixteen fifty.

No. 2—Seventeen fifty.

Right of arc—White house—Left bottom corner.

Traversing right and left—Two taps.

Medium.

Fire.

NOTE.—A fire direction order has been given that "medium" rate of fire is to be employed.

3. Target—A dark spot in a field.

Range estimated from a key range—1700 yards.

Fire order.

No. 1—Sixteen fifty.

No. 2—Seventeen fifty.

Last target—Left eight o'clock three degrees—Dark spot.

Traversing right and left—Two taps.

Wind—Right—Two taps.

Fire.

....

Stop.

No. 1—Down one hundred.

No. 2—Up one hundred.

Go on.

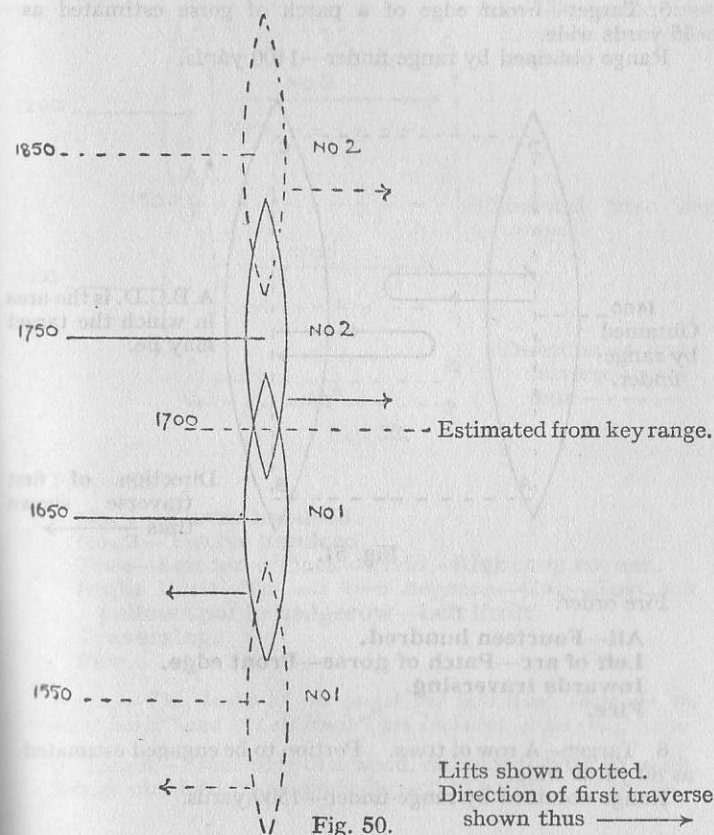


Fig. 50.

4. Target—A brown mound.

Range estimated from a key range—1250 yards.

Fire order.

No. 1—Twelve hundred.

No. 2—Thirteen hundred.

Centre of arc—Brown mound.

Traversing right and left—Three taps.

Fire.

NOTE.—The width of target is measured as 1° , requiring two taps either side of centre. The other tap is given because the range is over 1100 yards.

5. Target—Front edge of a patch of gorse estimated as 45 yards wide.

Range obtained by range-finder—1400 yards.

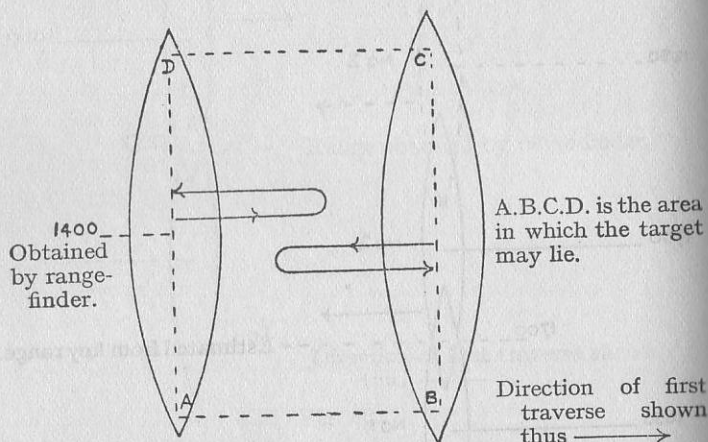


Fig. 51.

Fire order.

All—Fourteen hundred.

Left of arc—Patch of gorse—Front edge.

Inwards traversing.

Fire.

6. Target—A row of trees. Portion to be engaged estimated as 80 yards wide.

Range obtained by range-finder—1500 yards.

Fire order.

All—Fifteen hundred.

Right of arc—Stack—Immediately above line of trees—From left end—To right three degrees—A dead tree.

Inwards traversing.

Wind—Left—One tap.

Fire.

7. Target—A portion of a hedgerow. Estimated width 40 yards.

Range estimated from a key range—1150 yards

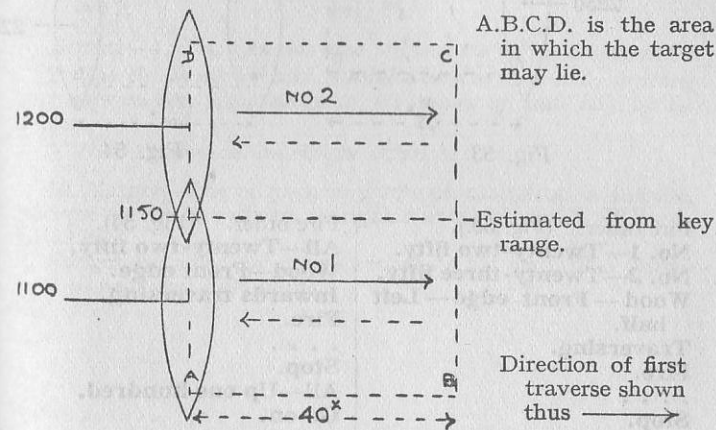


Fig. 52.

Fire order.

No. 1—Eleven hundred.

No. 2—Twelve hundred.

Tree—Left ten o'clock—Field—Right top corner.

Right limit—To left two degrees—Gap—Just left yellow spot in hedgerow—Left limit.

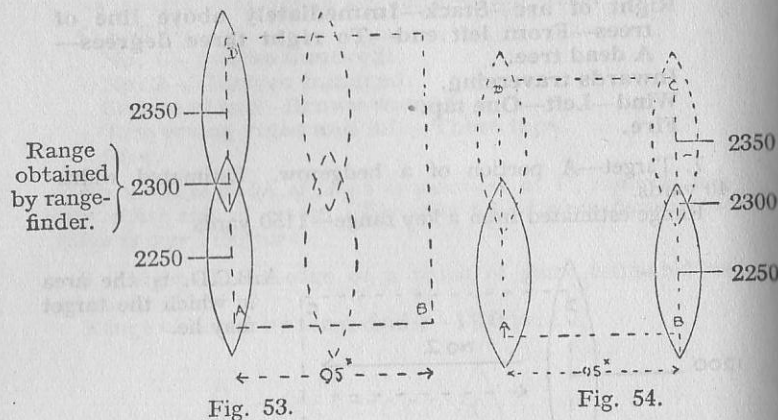
Traversing.

Fire.

NOTE.—The flanks of the target are indistinct, therefore the "Right limit" and "Left limit" are included in the indication.

8. Target—Front edge of a wood, estimated width 95 yards. Range obtained by range-finder—2300 yards.

Alternative procedure



Fire order. (Fig. 53.)

No. 1—Twenty-two fifty.
 No. 2—Twenty-three fifty.
 Wood—Front edge—Left half.
 Traversing.
 Fire.

 Stop.
 Right half.
 Traversing.
 Go on.

Fire order. (Fig. 54.)

All—Twenty-two fifty.
 Wood—Front edge.
 Inwards traversing.
 Fire.

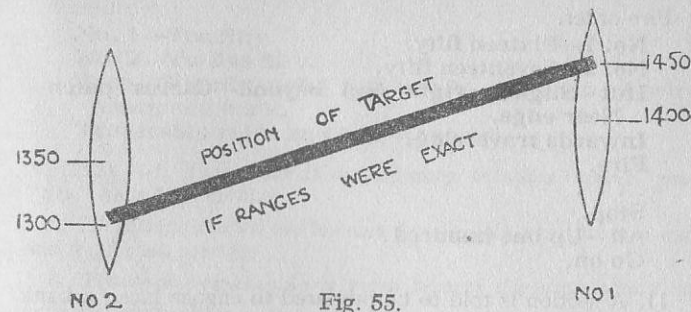
 Stop.
 All—Up one hundred.
 Go on.

9. Target—A bank oblique to the line of fire. Angular width about 3° (70 yards at 1400).

Ranges obtained by range-finder—to far end 1450 yards, and to near end 1300 yards.

Fire order.

No. 1—Fourteen hundred.
 No. 2—Thirteen fifty.
 Left of arc—Prominent bank.
 Inwards traversing.
 Fire.

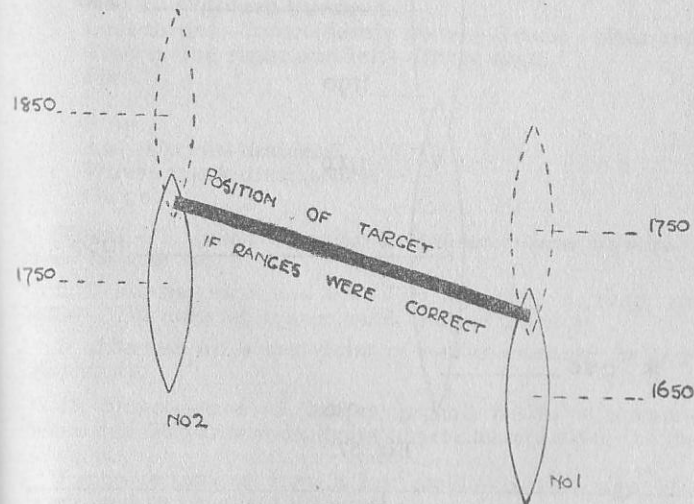


NOTES.—1. No. 1 in this case is given the higher elevation.
 2. The elevations for each gun have been arrived at by working out approximately the range to the centre of each half of the target.

3. Nos. 1 carry out an oblique traverse.

10. Target—The edge of a patch of cactus on a hillside, oblique to the line of fire. Angular width about 2° (60 yards at 1750).

Ranges obtained by range-finder—to far end 1800 yards, and to near end 1700 yards.



Fire order.

No. 1—Sixteen fifty.

No. 2—Seventeen fifty.

Hut—Slightly right and beyond—Cactus patch—
Near edge.

Inwards traversing.

Fire.

.....

Stop.

All—Up one hundred.

Go on.

11. A section is told to be prepared to engage later, a bank running away from the guns, nearly along the line of sight. It is required to cover as much of the bank as possible without a lift.

Range obtained by range-finder to near end 1000 yards.

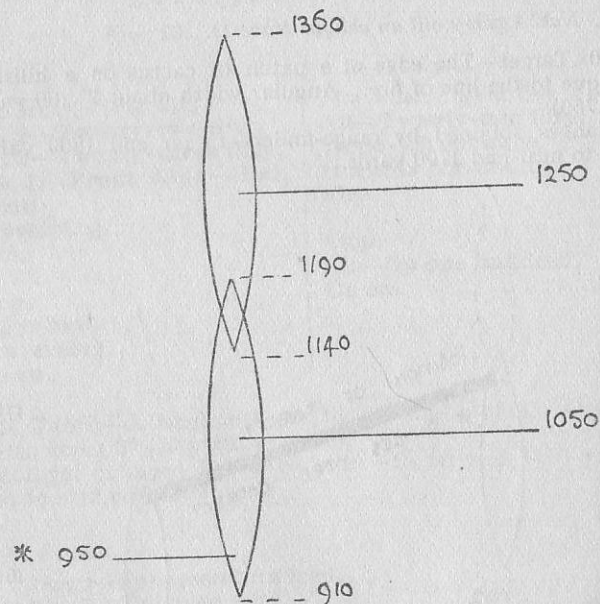


Fig. 57.

* Position of near end if full 5 per cent. error short has been made.

Fire order.

No. 1—Ten fifty.

No. 2—Twelve fifty.

Tree—Slightly right and below—Junction of wire fence and bank.

Traversing right and left—One tap.

NOTES.—1. This order is anticipatory, therefore "wind" and "fire" have been omitted.

2. Elevations worked out to cover permissible error for near end and to give an overlap.

3. Traversing right and left given because the mean of the two ranges is over 1100.

4. An order of this type will only be given when there is time to work out the details. In the case where it is necessary to engage this target quickly, the elevations 1050 and 1150 would be suitable to commence with, lifts as required being ordered later.

12. Target—A track running away from the guns up a slope.

Ranges obtained by range-finder—to near end 1750 yards, and to where track disappears 1950 yards.

Fire order.

No. 1—Seventeen hundred.

No. 2—Eighteen hundred.

Last target—Immediately above—Track—Near end.

Traversing right and left—Three taps.

Fire.

.....

Stop.

All—Up two hundred.

Where track disappears.

Go on.

NOTES.—1. Initial elevations worked out to cover permissible error for near end.

2. Traversing right and left—Two taps given as range over 1500. The extra tap to cover width or slight obliquity.

3. After the lift a new point of aim is necessary, as target sloping up.

13. Target—Area of broken ground beside a stream—estimated 70 yards wide, lying approximately along the line of sight.

Ranges estimated from a key range—to near edge 1150 yards and to far edge 1350 yards.

Fire order.

All—Eleven hundred.

Bridge—Immediately below—Bend in stream—
From bend to left three degrees—Small brown
mark.

Inwards traversing.

Fire.

.....

Stop.

All—Up one hundred (=1200).

Go on.

.....

Stop.

All—Up one hundred (=1300).

Go on.

.....

Stop.

All—Up one hundred (=1400).

Go on.

NOTES.—1. The initial elevation is the lower of the two required to cover permissible error for near edge.

2. The final elevation is the higher of the two required to cover permissible error for far edge.

3. If the target is on a forward slope, or fire is plunging, a new point of aim should be given for first lift $\frac{1}{3}$ rd of the distance between the near and far edge, for the second lift $\frac{2}{3}$ ds of this distance, and for the final lift the far edge.

14. Target—Part of a railway siding and a dump beyond, estimated width 40 yards, lying approximately along the line of sight.

Ranges obtained by range-finder—to near edge 1400 yards, far edge estimated from this 1750 yards.

Fire order.

No. 1—Fourteen hundred.

No. 2—Fifteen hundred.

Church—Right two o'clock—Railway platform—
Left half.

Traversing.

Fire.

.....

Stop.

All—Up two hundred (No. 1—1600).

Go on. (No. 2—1700).

.....

Stop.

All—Up two hundred (No. 1—1800).

Go on. (No. 2—1900).

NOTES.—1. One elevation at 1400 will cover the permissible error for near edge. The elevation for the other gun can therefore be increased to 1500 to engage depth.

2. Lifts of 200 are given until the highest elevation required to cover the permissible error for the far edge is reached.

3. If on a slope, the point of aim must be altered with each lift, as in the last example.

15. Moving target.

Target—Four machine-gun carriers moving obliquely from right to left towards our front.

Range when first seen 1600 yards.

The fire controller estimates the speed of the target as 10 m.p.h., and selects aiming points for the guns about 300 yards ahead of the target.

Fire order.

All—Twelve fifty.

Lone tree—Right—Line of trees—Gap in trees.

No. 1—Right edge.

No. 2—Left edge.

Fire.

.....

Stop.

Go on.

NOTES.—1. The order to fire will be given when the leading vehicle is 45' right of gap.

2. Order "Stop" after a burst of 50-60 rounds.

3. "Go on" is ordered on the assumption that a second machine-gun carrier is about to pass through the gap.

73. Examples of indirect fire orders

1. Point target, or target not wider than gun frontage.

Range obtained by range-finder 1250 yards.

Director method.

Fire controller

Zero lines.

No. 1—Right—Two one
degrees
one owe
minutes.

No. 2—Right—Nine
degrees.

N.C.O. i/c gun line

All—On director.

No. 3—Left—Seven
degrees
four owe
minutes.

No. 4—Left—One nine
degrees.

Elevation—All—Two
degrees
five
minutes.

Out aiming posts.

Load.

Traversing—Right and left
—One tap.

Wind—Left—One owe
minutes.

Fire.

2. Target—Estimated 150 yards wide without great depth.
Range obtained by range-finder 1550 yards.
Post method: Pivot gun, No. 1.

Fire controller

Reports "Guns ready to
load."

N.C.O. i/c gun line

All—On No. 1.

Zero lines.

No. 4—Left—Eight seven
degrees two owe minutes.

No. 3—Left—Eight four
degrees.

No. 2—Left—Eight two
degrees five owe minutes.

Reports "Guns on parallel
lines."

Elevation—All—Two de-
grees one owe minutes.
Out aiming posts.

Reports "Guns ready to
load."

Load.

Distribution.

No. 1—Nil.

No. 2—Left—One degree
one five minutes.

No. 3—Left—Two de-
grees three five
minutes.

No. 4—Left—Three
degrees five owe
minutes.

Traversing—Right and left
—Three taps.

Wind—Right—Three five
minutes.

Fire.

Stop.

All—Up two owe minutes.

Go on.

74. Barrage fire

1. When a large number of guns and sufficient ammunition are available, machine guns may be employed for barrage fire. This entails firing on definite lines for definite periods, the guns acting under centralized control.

Machine-gun barrages will usually be required as part of a fire plan which will include artillery fire and the fire of any other weapons available, such as trench mortars, etc. The tasks therefore allotted to machine guns must be those most suited to the characteristics of the gun.

2. There are two types of barrage fire:—

- i. *Creeping barrage*.—In which the barrage moves over an area of ground. The machine-gun barrage would be synchronized with the artillery time table. The line on which the barrage opens, and the lifts, are worked out having regard to safety considerations.
- ii. *Standing barrage*.—Put down on a definite line and remaining there as long as required or safety considerations permit.

3. *Rates of fire*.

Before rates of fire are ordered, the following factors must be considered:—

- i. Tactical requirements of the barrage.
- ii. Frontage for each machine gun.
- iii. Wear and tear of guns.
- iv. Endurance of personnel.

4. *Frontal, oblique and flanking barrages*.

The frontal barrage is usually easier to arrange and control: it has the disadvantage that the safety of our own troops may

require that the barrage should not be put down nearer than 300 or 400 yards in front of them. This disadvantage may be overcome in certain cases by clearing our own troops out of the line of fire.

The flanking barrage may be put down much closer to our own troops than the frontal barrage, its employment will depend on the existence of suitable M.G. positions.

The oblique barrage has the advantages and disadvantages of the frontal and flanking types according to the degree of obliquity.

Frontal and oblique barrages require traversing; the flanking barrage does not. Two parallel flanking barrages about 60 yards apart should be employed rather than a single flanking barrage from the same total number of guns.

Box barrages are frequently required for such purposes as raids, etc. These barrages can be obtained by a combination of frontal with oblique or flanking fire.

5. In the preparation of a machine-gun barrage, tasks will normally be allotted to platoons by the brigade machine-gun officer, who will often also select the position from which the tasks are to be carried out. Barrages will generally entail the use of fire direction and fire control charts. (Sec. 64.)

APPENDIX I

COURSES—INDIVIDUAL TRAINING

1. *The seven weeks' course for the 1st year machine-gunner*, reference Sec. 11, 2, i.

i. The suggested allotment of hours to subjects is given in the syllabus (sub-para. ii). The sequence of instruction given below should be followed in making out the programme for this course.

(a) *Mechanical subjects.*

The course should open with a general description of the gun, etc. (Handbook .303-inch Vickers Machine Gun, 1930, Sec. 4), and a demonstration of "Characteristics" on the 30-yards range.

The bulk of the mechanical instruction should be done during the first half of the course.

(b) *Drills.*

Elementary gun drill should be carried out in the first half of the course, and the T.O.E.D. concluded in the fourth week.

(c) *Fire discipline.*

Visual training should be carried out early in the course. *Recognition* should be completed before Section drill—Direct fire.

Fire orders should be taught concurrently with and practised in Section drill—Direct fire.

(d) *30-yards Range.*

Part I, A.M.G.C., can be carried out any time after T.O.E.D.

After carrying out Section drill—Night firing, the men should fire at night on a 30-yards range. The remedying of stoppages should be included.

A 30-yards range competition should be carried out at the end of the course.

(e) *Miscellaneous.*

Aiming instruction should be given before sight setting and laying. (Elementary gun drill.)

Instruction in ranging may be given at any time before the man fires the observation and registration practices in Part II, A.M.G.C.

Machine-gun signals should be taught partly during elementary gun drill and partly during initial instruction in fire orders.

T.O.E.D. should be carried out on completion of elementary gun drill.

Recognition test, to see whether the man can follow an indication correctly, measure hand angles and take the correct point of aim for his gun, as part of a fire unit.

ii. *Syllabus.*

Mechanical subjects.

	Hours
Brief description, etc., load, fire, unload.. ..	2
Care and cleaning	4
Stripping	14
I.A.	20
Points before, during and after firing	5
Repairs and adjustments	4
Spare parts	3

52

Drills.	Hours
Elementary gun drill	28
Section drill :—(a) Direct fire	10
(b) Night firing	6
Platoon drill—Indirect fire	6
Instruction in packing limbers	1
Battle drill	2

53

Fire discipline.	Hours
Visual training	6
Recognition	12
Fire orders	12

30

30-yards range.	Hours
Characteristics—Demonstration	2
Part I, A.M.G.C.	8
Night firing, with I.A.	2
30-yards Range Competition	2

14

Miscellaneous.	Hours
Aiming instruction	2
Instruction in ranging and registration	3
Use of instruments	6
Machine-gun signals	2
Night-firing instruments and night aiming	3
T.O.E.D.	4
I.A. Test	1
Recognition test	2

23

Summary and total.	Hours
Mechanical subjects	52
Drills	53
Fire discipline	30
Range	14
Miscellaneous	23

172

2. Fire unit commanders' course, reference Sec. 11, 4.

i. Direct fire control	Hours
Lectures :—(a) Introduction to fire control	$\frac{1}{2}$
(b) Sequence of direct fire order, range or ranges (Rules)	$\frac{1}{2}$
(c) Indication and recognition	1
(d) Method of fire	1
(e) Climatic allowances	$\frac{1}{2}$
(f) Overhead fire and flanking fire rules, and use of slide rule	1

4 $\frac{1}{2}$

Instruction out of doors :—	Hours.
After lecture (c)	5
After lecture (d)	3
After lecture (e)	3
(Practice in complete fire order.)	
After lecture (f)	3

14

ii. Indirect fire control.

Lectures :—(a) Introduction to Indirect fire	$\frac{1}{2}$
(b) Sequence of Indirect fire order, post and distant aiming point methods	1
(c) Director methods	1
(d) Elevation	$\frac{1}{2}$
(e) Distribution and Traversing	$\frac{1}{2}$
(f) Duties of fire controller in Indirect fire	$\frac{1}{2}$
(g) Preparations for night firing	$\frac{1}{2}$

4 $\frac{1}{2}$

Instruction out of doors :—	Hours
After lecture (a). (Section drill—Direct fire. Sec. 26, 6)	$\frac{1}{2}$
After lecture (b)	$\frac{1}{2}$
After lecture (c)	6
After lecture (d)	2
After lecture (e)	2
After lecture (g)	1

12.

iii. Tactical instruction.

Lectures :—Platoon roles in attack	$\frac{1}{2}$
Platoon roles in defence	$\frac{1}{2}$
Platoon commanders' reconnaissance and orders	$\frac{1}{2}$
Platoon roles, rear guard	$\frac{1}{2}$

2

iv. Field duties.

Sand-table lectures.

General considerations in the occupation of positions	$\frac{1}{2}$
Occupation of a direct fire position	$\frac{1}{2}$
Occupation of an indirect fire position	$\frac{1}{2}$
Occupation of a section position in defence	1
Withdrawal from a fire position in face of opposition	$\frac{1}{2}$
Occupation of a position at night	$\frac{1}{2}$

3 $\frac{1}{2}$

v. H.Q. Training.

Reconnaissance of gun positions within a section area	2
Attack	2
Defence	2
Withdrawal	1

7

vi. *Miscellaneous—Drills.*

	Hours
Lecture :—The sequence and object of the various drills	$\frac{1}{2}$
Demonstration :—(a) Teaching gun drill	2
(b) Training of gun numbers in use of ground and cover	1
	<hr/> 3 $\frac{1}{2}$

vii. *Summary of hours.* Total 51 hours.

APPENDIX II

LIST OF EQUIPMENT AND DISTRIBUTION BETWEEN THE FORE AND REAR PORTIONS OF THE LIMBER

Fore portion

- 7 Boxes of stripless ammunition.
- 1 Spare parts box.
- 2 Capes, machine-gunners.
- 2 prs. Gloves, machine-gunners.
- 2 Cases, cans, oil.
- 2 Guns in chests.
- 2 Tripods.
- 2 Condenser cans.
- 2 Condenser tubes.
- 2 Spare parts cases.
- On the outside of the limber—
- Rear board—2 shovels.

Rear portion

- 1 Range-finder in box.
- 2 Vervey pistols.
- 1 Horse valise.
- 2 Hangers (gun and tripod).
- 2 Ammunition racks for pack.
- 2 Web surcingles.
- 2 Water buckets, hay nets and brushes.
- 2 Leather surcingles.
- 1 Night firing box.
- 2 Blankets.
- *1 Field plotter.
- *2 Set squares.
- *1 Ebony ruler.
- *1 Director.
- *2 Clinometers, with bar foresights in cases and pouches.
- *1 Set drawing instruments.
- 1 Folding saw.
- 1 Mallet, heel peg.
- 7 Boxes (2 belts in each) stripless ammunition.
- 2 Aiming posts.
- 2 Zero posts.
- 2 lb. old linen.
- 4 Spare belts (web).
- 2 Drivers' packs.
- *2 Pins, J.C.H.
- *2 Pins, J.E.C.
- *1 Screw, clamp, checking traverse.
- *2 Spare batteries.
- 4 Horse rugs (according to season).
- Ammunition for Vervey pistols.

Outside rear portion

- Front :—1 stand, director.
- Left side :—2 picks.
- 2 bill hooks.
- Right side :—2 shovels.

N.B.—Those marked * will be carried in a box on the rear portion of the limber as shown.

This box will be named the Instrument Box.

APPENDIX III

LOAD TABLES—PACK (CAVALRY)

Near side	lb.	Top load	lb.	Off side	lb.
GUN HORSE					
Gun (with barrel casing filled and tripod crosshead attached) ..	58	Shoe case (filled)	3½	Tripod (less cross-head) ..	36
Hanger, gun, sling, cavalry ..	7	Spare barrel and cleaning rod in case ..	5½	Box (with ammunition) ..	21
Nose-bag (with feed) ..	8			Hanger, tripod, sling, cavalry ..	4½
				Nose-bag (with feed) ..	8
				Sling, boxes, ammunition in belt, cavalry ..	2½
Total ..	73	Total ..	9	Total ..	72

Recapitulation of Weights

Load, off side ..	72
Load, near side ..	73
Top load ..	9
Pack saddle ..	40
Grand total ..	194

Near side	lb.	Top load	lb.	Off side	lb.
1ST AMMUNITION HORSE					
2 boxes, ammunition in belt (filled)	42	Shoe case (filled)	3½	3 boxes, ammunition in belt (filled) ..	63
Condenser in carrier (filled) ..	28			Rack, boxes, ammunition in belt, Mark III ..	12
Shovel (in cap) ..	5			Shovel (in cap) ..	5
Nose-bag (with feed) ..	8			Nose-bag (with feed) ..	8
Rack, boxes, ammunition in belt, Mark III ..	12			Case, can, oil ..	8
Total ..	95	Total ..	3½	Total ..	96

Recapitulation of Weights

Load, off side ..	96
Load, near side ..	95
Top load ..	3½
Pack saddle ..	40
Grand total ..	234½

Near side	lb.	Top load	lb.	Off side	lb.
2ND AMMUNITION HORSE					
3 boxes, ammunition in belt (filled)	63	Shoe case (filled)	3½	3 boxes, ammunition in belt (filled)	63
Rack, boxes, ammunition in belt, Mark III ..	12	Pick and helve ..	8	Rack, boxes, ammunition in belt, Mark III ..	12
Nose-bag (filled)	8			Nose-bag (filled)	8
Total ..	83	Total ..	11½	Total ..	83

Recapitulation of Weights

Load, off side ..	83
Load, near side ..	83
Top load ..	11½
Pack saddle ..	40
Grand total ..	217½

APPENDIX IV

LOAD TABLES—PACK (INFANTRY)

The following load tables should be considered as a guide, owing to the necessity of adapting the loads to suit the local conditions :—

Near side	lb.	Centre	lb.	Off side	lb.
GUN PACK					
Tripod	52	Ammunition box (stripless) ..	43	Gun, with barrel casing (filled) ..	42
Hanger, tripod, sling	9	Nose-bag (filled) Case, horseshoe (filled)	8 3	Hanger, gun, sling Cleaning rod ..	8 1
				Spare parts case	8
Total	61	Total	54	Total	59

Recapitulation of Weights

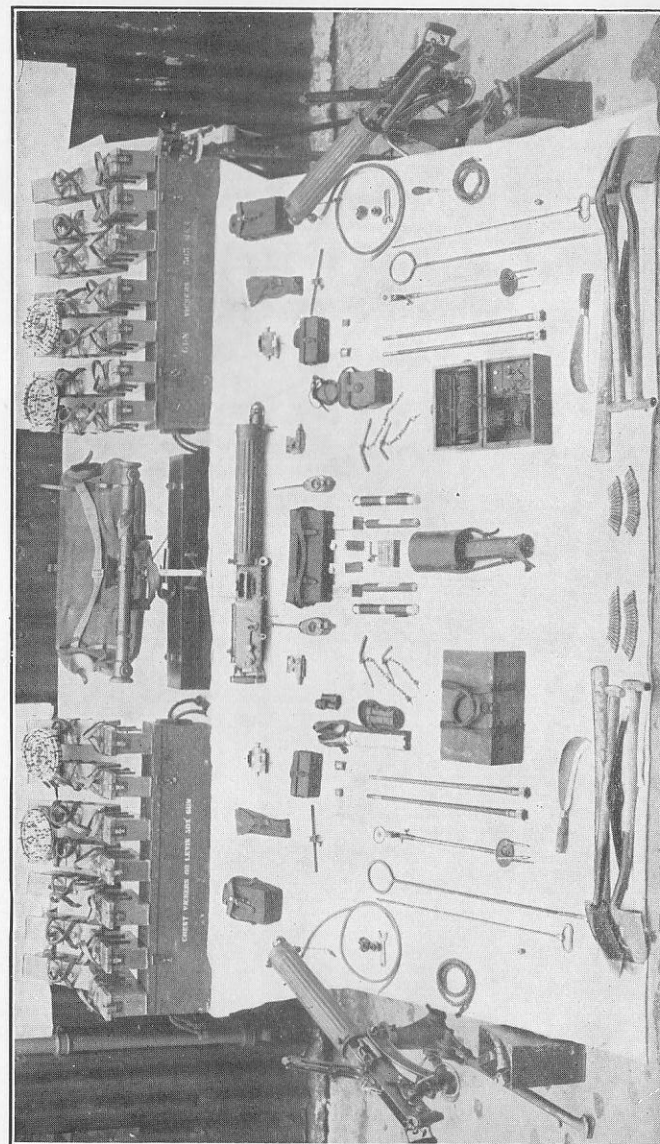
			lb.
Near side			61
Centre			54
Off side			59
Pack saddle			28
Grand total			202

Near side	lb.	Centre	lb.	Off side	lb.
AMMUNITION PACK					
2 boxes, belt (single)	42	Bucket, canvas ..	1	4 boxes, belt (single)	84
Rack canvas	6			Rack canvas	6
Case, can, oil	8			Case, horseshoe (filled)	3
Nose-bag (filled) ..	8				
Condenser	25				
" tube	1½				
Carrier	3				
Total	93½	Total	1	Total	93

Recapitulation of Weights

			lb.
Near side			93½
Centre			1
Off side			93
Pack saddle			28
Grand total			215½

APPENDIX V
PLATE XXIII
A SECTION'S EQUIPMENT LAID OUT FOR INSPECTION



INDEX

Note.—No reference to drill movements or detail is made in this index. Headings of sections dealing with drill will be found in the Table of Contents.

A.		PAGE
Aiming mark—		
— Auxiliary : definition of term	...	2
— Gun : definition of term	...	2
Aiming post, M.G., Mk. I, instructions for use of	...	24 <i>et seq.</i>
" lamp : use of	...	31
Air photographs, oblique, use of	...	176
" temperature, varying effect on shooting	...	133
Ammunition—		
— Supplies : problems of, to be considered during individual training	...	9
— Tracer, use of in ranging	...	139
Angle of—		
— Concentration : definition of term	...	3
— Deviation : definition and calculation of	...	185
— Distribution : definition of term	...	3
— Sight : definition of term	...	2
— Tangent elevation : definition of term	...	2
Angles, method of giving in orders	...	205
Anti-gas defence, training in	...	8
Arc of fire—		
— Definition of term	...	1
— Description of : details	...	18
Area to be engaged, considerations affecting	...	135 <i>et seq.</i>
Armoured fighting vehicles, engagement of	...	152
B.		
Barometer, rise and fall of ; effect on shooting	...	133
Barrage fire, general considerations	...	223
Beaten zone—		
— Observation of fire : definite information needed	...	139
— Theory of, elementary	...	129
Brigade exercises : details of	...	12
Brigade machine gun officer—		
— Responsibilities and duties of	...	7
— Schemes, tactical : problems to be set to exercise	...	10, 12
C.		
Camouflage—		
— Considerations in use of	...	109
— Entrenchments : care in	...	124
Chart—		
— Barrage fire ; direction and control, necessity for	...	224
— Fire control : details and preparation of...	...	183
" specimen	...	187
" direction and control : use of for	...	183
" direction : preparation of	...	183
" specimen	...	186
Climatic influences : normal conditions	...	132

Clinometer—	PAGE
— Instructions for use of	26
— Use of in indirect laying	154
Collective training, stages of	8
Combined sights—	
— Indirect fire, application of rule	169
— Inwards traversing never used with	149
— Necessity for use of : factors in	138
— Rules : application of	136
Company training, details of collective	12
Compass, use of for giving zero line	178
Concealment : general considerations	109
Concentration—	
— Angle of : consideration regarding	165
— Definition of term	3
— Map shooting : procedure	178
Concentrations : administrative arrangements for	8
Control post for direct fire : organization of	204
Courses, individual training : syllabus for	225 <i>et seq.</i>
Crest clearance—	
— Considerations and procedure	169 <i>et seq.</i>
— Map shooting : procedure for	180
— Responsibility for	170
— T.O.G. method : procedure for ascertaining	183
Crest method for parallel lines	163

D.

Defence, special duties in occupation of position	119
Definitions : terms used	1 <i>et seq.</i>
Deflection—	
— Bar foresight : instructions for use	23 <i>et seq.</i>
— Definition of term	3
Demonstrations, preparation of	8
Deviation, angle of : definition and calculation of	185
Direct fire—	
— Advantage of, main... ..	141
— Application of : general remarks	143
— Definition of term	1
— Direction and control of : considerations	202
— Disadvantages, technical, of	142
— Duties of fire controller	204
— Fire unit for	5, 6, 125
— Normal method of engaging targets	141
— Orders : examples	212 <i>et seq.</i>
— " sequence and details of	206 <i>et seq.</i>
— Positions : arrangements necessary for indirect fire to be made	142
— Procedure for engagement of targets by	142
Direction—	
— Dial, Mk. II, instructions for use of	25
— Direct fire orders, details of ranging corrections	207
— Errors in, causes of	135
— Indirect fire, errors in : application of allowances for	155
— Laying guns by indirect means	153
— Map shooting, means of giving	176
— Methods of fire : applicable to	143
— Reference point, use of for	177
— T.O.G. method : disadvantages and use of	180
Director—	
— No. 4, Mark II : instructions for use of	27
— Use of for parallel lines	156 <i>et seq.</i>
Distant aiming point method for parallel lines	162

Distribution—	PAGE
— Considerations regarding angle of	164
— Definition of term,	3
— Map shooting : procedure	178
— T.O.G. method : procedure for obtaining	182
Drivers, training of	15

E.

Elevating wheel : instructions for use of	26
Elevation—	
— Corrections for during ranging : considerations	140
— Direct fire orders, details of ranging corrections	207
— Elementary theory of	126
— Errors in : causes of	135
— Indirect fire orders : notes on	209, 210
— Indirect laying : application of	154
— Map shooting : procedure for obtaining	178
— Methods of fire : applicable to	146
— Quadrant angle, process of obtaining in voice-control methods	166 <i>et seq.</i>
Entrenching, considerations	124
Equipment—	
— Distribution of on limber	229
— Section, laid out for inspection (Plate XXIII)	<i>Facing page</i> 232

F.

Field Plotter, Mark IV : instructions for use of	28
Signals	40
Fighting map, preparation and use of	180
Fire—	
— Application, general	135 <i>et seq.</i>
— Bursts of when ranging guide to lengths of	140
— Opening of, premature : danger of	203
— Plan, preparation of	202
— Rates of : considerations in use	203
— Surprise factor in : value of	125
Fire control—	
— Charts, use of for	183
— Definition of term	1
— Observation posts : selection of	109
— Orders, basis of framing	125
— Principles applicable to both direct and indirect fire	142
— Rules : basis for	135
Fire controller, definition of term	1
Fire direction—	
— Charts, use of for	183
— Definition of term	1
— Term, meaning of : considerations	202
Fire orders—	
— Direct : sequence and details of	206 <i>et seq.</i>
— Giving of : considerations affecting	205
— Indirect : sequence and notes on	209 <i>et seq.</i>
— Instruction in : details	18 <i>et seq.</i> , 22
— Sequence, adherence to, necessity for	205
— Flank observation of fire : general	141
Flanking fire—	
— Definition of term	1
— Rules for	190
— Safety angle for : definition of term	3
Frontage, gun and platoon : extent of	154

G.		PAGE
Graph—		
— Q.A., construction and use of ...	...	132
— Wind, use of ...	...	133
— V.I. uses of ...	...	131
Gun aiming mark: definition of term ...	...	2
„ line, considerations in selection of ...	...	108
H.		
Headquarters, training of: details for ...	...	16
I.		
In action: definition of term ...	...	2
Indication—		
— Direct fire orders: methods of ...	...	207
— Recognition: details for instruction ...	...	18 <i>et seq.</i>
Indirect fire—		
— Accuracy of, factors affecting ...	...	153
— Advantage, technical, of ...	...	142
— Application of: general remarks ...	...	153
— Control of: consideration ...	...	202
— Day: use of fire control chart at guns ...	...	185
— Definition of term ...	...	1
— Disadvantages of ...	...	142
— Duties of fire controller ...	...	205
— Fire unit for ...	...	5, 6
— Orders during a shoot ...	...	209 <i>et seq.</i>
— Orders, examples of ...	...	221
— Use of: considerations and occasions for ...	...	141, 142
— Unit: platoon, normal: reasons for ...	...	126
Individual training—		
— Aim of ...	...	8
— Details of ...	...	9
— Sequence of: general considerations ...	...	13 <i>et seq.</i>
— Standard for, at conclusion of ...	...	10
— System of: general ...	...	13
Inspection, section's equipment laid out for	Plate XXIII Facing page	232
Instruments—		
— Out of adjustment: action concerning ...	...	23
— Instruction in use of: details ...	...	23 <i>et seq.</i>
Intervals, direct and indirect fire positions ...	...	126
L.		
Landscape targets, use of for instruction in fire orders ...	...	22
Laying—		
— Definition of term ...	...	1
— Indirect method, general ...	...	153 <i>et seq.</i>
— Normal method of ...	...	141
Lift, explanation of term ...	...	146
Limber, distribution of equipment on ...	...	229 <i>et seq.</i>
Line—		
— Corrections for: method of obtaining ...	...	140
— Definition of term ...	...	2
— Zero: definition of term and use of ...	...	3
Line of fire: definition of term ...	...	3
„ sight not horizontal: effect of ...	...	129
Load tables, pack—		
— Cavalry ...	...	230
— Infantry ...	...	232

M.		PAGE
Machine gunners—		
— Establishment of and turnover ...	...	6
— First and second-year men, training of ...	...	15
— Selecting men for, training: considerations ...	...	6
— Weapon training for ...	...	10
Machine guns—		
— Role, main, tactical ...	...	189
— Sighting of, theory ...	...	128
Map—		
— Fighting: preparation and use of ...	...	180
— Range from, permissible error ...	...	136
— Safety calculations from for overhead fire ...	...	199
— Shooting: chart for control of: use ...	...	183
„ from: considerations and procedure ...	...	176 <i>et seq.</i>
Method of fire—		
— Direct fire orders: details in ...	...	207
— Direction: applicable to ...	...	143
— Elevation, applicable to ...	...	146
— Factors on which dependent ...	...	143
— Rule for use of depending on target ...	...	147
Minimum clearance: definition of term ...	...	3
Moving targets, methods of engagement ...	...	151 <i>et seq.</i>
N.		
N.C.O.s., training of ...	...	15, 16, 21
Near limit of arc: definition of term ...	...	1
Night aiming instructions ...	...	30 <i>et seq.</i>
Night firing—		
— Chart for control of: use of ...	...	183
— Procedure and safety precautions ...	...	172 <i>et seq.</i>
O.		
Observation of fire—		
— Beaten zone; importance of definite information regarding ...	...	139
— Firer, when carried out by ...	...	141
— Flank: general considerations ...	...	141
— Limited to certain type of ground ...	...	135
— Normal method of carrying out ...	...	141
— Scope of: limits to ...	...	139
— Strike of bullets: factors affecting ...	...	139
— Training in: instructions ...	...	32
Observation post—		
— Definition of term ...	...	1
— Fire control: selection of ...	...	109
— Indirect fire: organization of ...	...	205
— Tactical: selection of ...	...	110
Observed fired: definition of term ...	...	1
Observers, training of ...	...	15, 21
Occupation of position—		
— Day: general detail of duties ...	...	110 <i>et seq.</i>
— Defence: special duties in ...	...	119
— Indirect fire: modifications for ...	...	114 <i>et seq.</i>
— Night: general detail of duties ...	...	118 <i>et seq.</i>
Officers, training of ...	...	15, 16, 21
Orderlies, training of ...	...	15, 21
Organization—		
— Basis of and general remarks on ...	...	4
— „ „ direct fire requirements ...	...	125
— Cavalry, machine gun squadron: details of ...	...	4
— Infantry, machine gun company: details of ...	...	5

	PAGE
Overhead fire—	
— Definition of term	1
— Rules for	190 <i>et seq.</i>
— Safety angle for: definition of term	3
P.	
Pack, details of	45
Packing of vehicles	40 <i>et seq.</i>
Parallel lines—	
— Crest method for giving	163
— Director method for giving	156 <i>et seq.</i>
— Distant aiming point method for giving	162
— Post method for giving	161
Permissible errors in range, maximum	136
Pivot gun—	
— Definition of term	3
— Description of	154
Platoon areas, selection and reconnaissance of	108
— training, details of collective	11
Position in readiness, definition of term	2
Post method, use of for parallel lines	161
Programmes, collective training: preparation of	11
Quadrant angle—	
— Definition of term	2
— Formula for calculation of	127
R.	
Range—	
— Cards, preparation of	48
— Errors in, maximum permissible	136
— Indirect fire, errors in: application of allowance for	154
— Method of giving in direct fire orders	206
Range-finding, permissible errors in	136
Range Table, description and use of	130 <i>et seq.</i>
Range-takers—	
— Qualifications for men selected for training as	47
— Training of	15, 21
— " in ranging	141
— " system of: details	47
— Turnover of	6
Ranging—	
— Bursts of fire during: guide to lengths of	140
— Corrections during: direct fire orders, details	209
— Definition of	139
— Elevation: corrections to during	140
— Instructions, preliminary: details of	33 <i>et seq.</i>
— Line corrections during: method of obtaining	140
— Principles, general	140
— Training all ranks in: limits to	141
— When carried out: occasions for	140
Rates of fire, details of for direct fire orders	208
Rearguard action: special duties in occupation of positions	121
Recognition and indication: details for instruction	18 <i>et seq.</i>
Reconnaissance of areas	108
Reference point, use of for giving zero line	177
Registering, definition of term	1
Reliefs after dark, arrangements for	175
Rendezvous: definition of term	2
Respirator, training when wearing	8
Revolver practice: limited to those armed	10

	PAGE
S.	
Safety angle—	
— Comparison of with the tangent angle: theory of	197
— Flanking fire: definition of term	3
— Overhead fire: considerations	193
— " definition of term	3
— Q.A. graph, use of for finding	200
— Tangent sight method for clearance	200
Safety of our troops—	
— Considerations and responsibility for	189, 203
— Night firing	175
Sand table, use of for training headquarters	16, 33
Section areas, reconnaissance of	108
— training, details of collective	11
Schemes—	
— Brigade exercises, scope of	12
— Concentrations: preparation for use at	8
— Individual training: framing of	9
Scouts, training of	15, 21
Sighting of machine guns, theory of	128
Signals, field	40
Slide rule—	
— Instructions for use of	29
— Rules for: modification of use	198
— Use of in overhead fire	194 <i>et seq.</i>
T.	
T.O.G. method for giving zero line	180 <i>et seq.</i>
Tactical observation post, selection of	110
— unit, machine gun	5, 6
Tangent angle: definition of term	2
Tap, regulation, extent and use of	143
Targets—	
— Classification of; purpose for	147
— Engagement of by direct fire: procedure	143
— " " indirect means: methods of	155
— " " direct: principles in	146
— " " indirect: procedure	169
— " " order of importance	203
— " " responsibility for	202
— General terms: important considerations when so received	203
— Moving: methods of engagement	151 <i>et seq.</i>
— " table of allowances for	152
— Night firing: considerations and procedure	172 <i>et seq.</i>
— Oblique: method of fire for	150
— Point: method of fire for	147
— Width of: methods of obtaining	146
— With a little width, method of fire for	147
— " depth: methods of fire for	150
— " width (not oblique): method of fire for	148
Temperature, air: varying effect on shooting	133
Tracer ammunition, value of use in ranging	139
Training—	
— Collective, general	10
— Headquarters: details of	16
— Individual, general	9
— N.C.Os.: instructions for	15, 16, 21
— Object of	7
— Observers: instructions for	15, 21

Training— <i>contd.</i>		PAGE
— Officers: details of ...	...	15, 16, 21
— Orderlies: instructions for ...	...	15, 21
— Range-takers: details of system ...	...	47
— " instructions for ...	...	15, 21
— Ranging: all ranks, limits to ...	...	141
— Responsibility for ...	...	7 <i>et seq.</i>
— Sand tables, use of for ...	...	16, 33
— Scouts: instructions for ...	...	15, 21
— Visual: instructions for ...	...	21 <i>et seq.</i>
— Transport, battalion, training of ...	...	8
— Traversing: definition of term and explanation ...	...	143 <i>et seq.</i>

U.

Unit—		
— Direct fire: section, reason for ...	...	125
— Fire: machine gun ...	...	5, 6
— Indirect fire: platoon, reasons for ...	...	126
— Tactical, machine gun ...	...	5, 6

V.

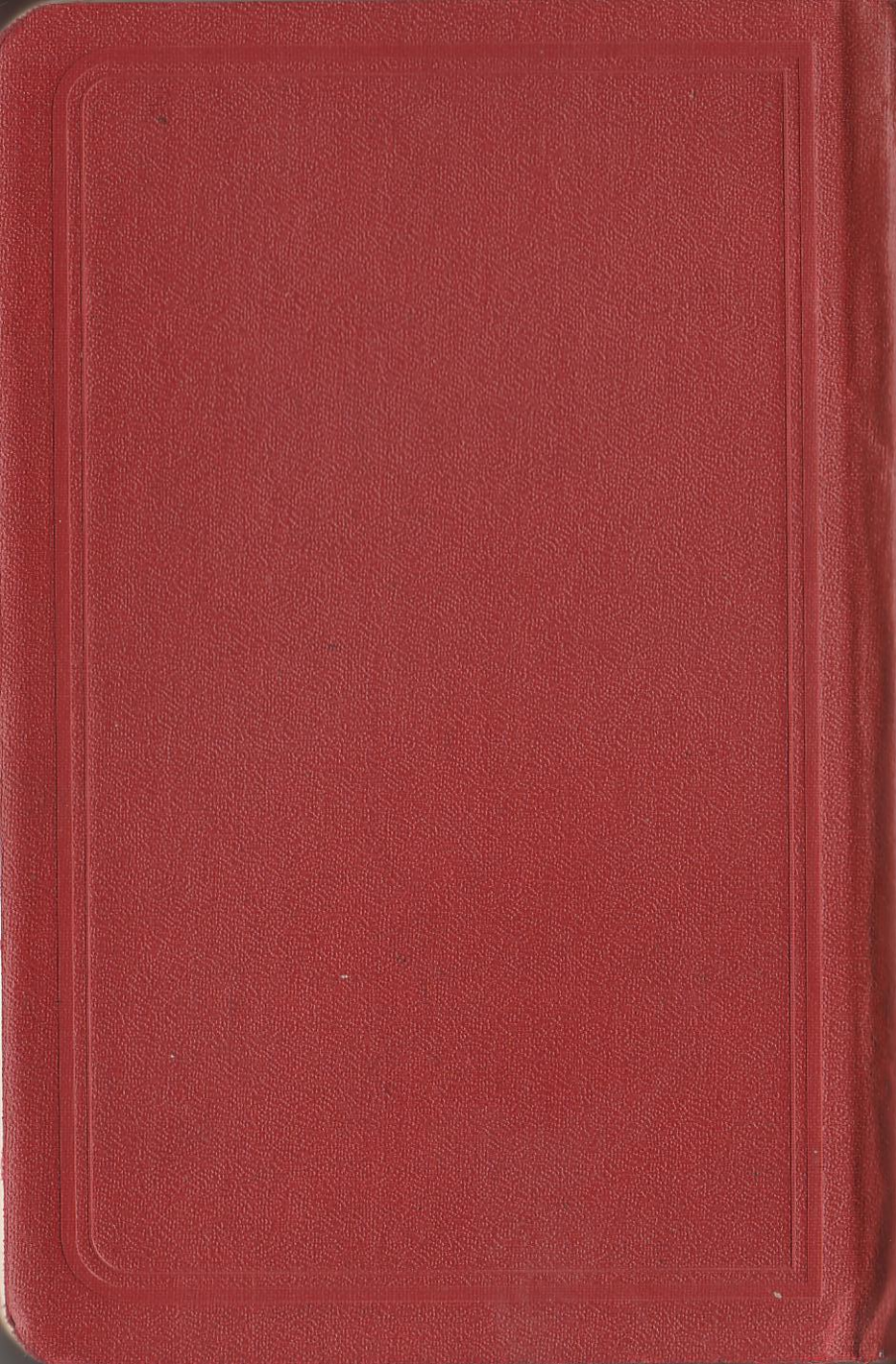
Vehicles, packing of ...	...	40 <i>et seq.</i>
Visual training: instructions ...	...	21
Voice-control methods—		
— Engagement of targets: types of ...	...	155
— Quadrant angle: process of obtaining in ...	...	166 <i>et seq.</i>

W.

Weapon training for machine gunners ...	...	10
Wind—		
— Corrections for: direct fire orders, details ...	...	209
— Effect on shooting ...	...	133

Z.

Zero line—		
— Definition of term and use ...	...	3
— Indirect fire orders: inclusion of ...	...	209
— Map shooting, methods of placing guns on ...	...	176
— Parallel, use and consideration of ...	...	154
— T.O.G. method: use of for ...	...	180
— Unsuitability of for subsequent targets: considerations ...	...	188
Zero post, M.G., Mk. I: instructions for use ...	...	25





This manual has been scanned by the
Vickers MG Collection & Research Association

www.vickersmg.org.uk

Please support the work of the Association.

Click on the image to donate through PayPal:



Or regularly support us through Patreon:

